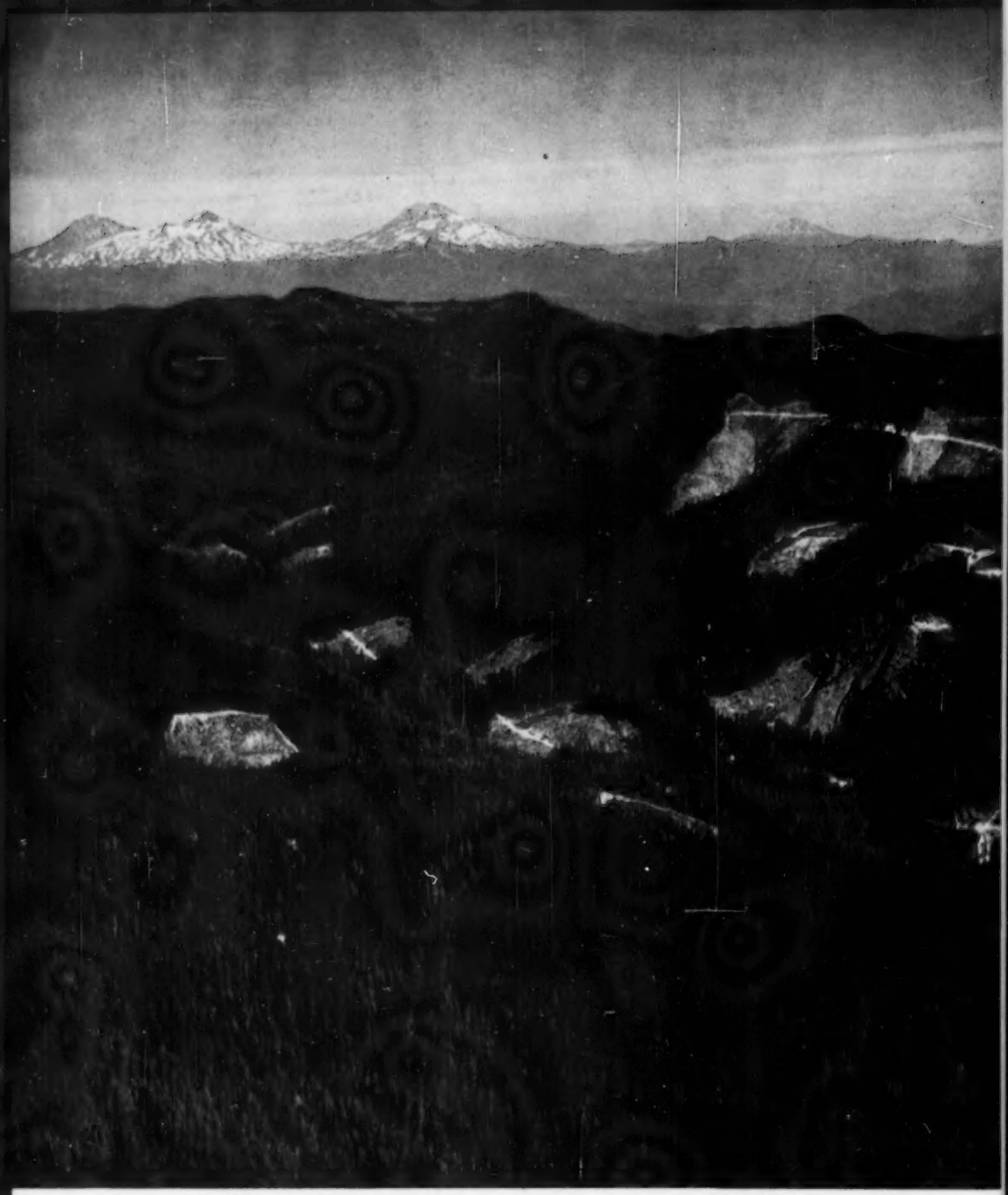
Journal of

FORESTRY

SEPTEMBER 1955

Volume 53
Number 9



S.A.F. Annual Meeting, Portland, Oregon, October 16-19

See Program Page 679

Keep "ON YOUR TOES" with

INDIAN

FIRE PUMPS

"Choice for Quality the World Over."

"We have used **SMITH INDIAN FIRE PUMPS** for several years and now need two more which please ship at once. We cannot afford to be without **INDIANS** and consider them to be the handiest piece of fire fighting equipment on our truck."

F. H. SANDERS, *Mayor*
Aliceville, Alabama

The INDIAN is available in the lever type, known as our No. 80 INDIAN.

Fire Truck unit built by Howe Fire Apparatus Co. of Anderson, Ind. and recently delivered to Library Fire Dept.; Library, Pa. Note **INDIAN FIRE PUMPS** mounted in place. More new trucks are coming through with **INDIANS** as specified equipment.

D. B. SMITH & CO. 407 MAIN ST. UTICA 2, N. Y.

Hercules Equipment & Rubber Company, Inc. San Francisco 7, Calif.
Halprin Supply Co. Los Angeles 15, Calif.

PACIFIC COAST BRANCHES
Fred E. Barnett Co. Portland, Oregon
Fred E. Barnett Co. Klamath Falls, Oregon
Mill & Mine Supply, Inc. Seattle 4, Washington
L. M. Curtis & Sons Salt Lake City, Utah

CANADIAN AGENTS
Flack Bros. Limited Vancouver, B.C., Canada
C. E. Hickey & Sons, Ltd. Hamilton, Canada

Established 1868

SEND FOR CATALOG DESCRIBING INDIAN FIRE PUMPS and containing many testimonials

VOLUME 53 • NUMBER 9 SEPTEMBER 1955

Journal of Forestry

Editorial Staff

ARTHUR B. MEYER ..... *Editor*

HENRY CLEPPER ..... *Managing Editor*

L. AUDREY WARREN ..... *Business Manager*

Associate Editors

HAROLD H. BISWELL, *Range Management*, School of Forestry, University of California, Berkeley 4, Calif.

ROBERT R. BLUMENSTEIN, *Forest and Wood Utilization*, Timber Engineering Company, 4812 Minnesota Avenue, N. E., Washington 19, D. C.

CHARLES C. BUCK, *Forest Fire*, Forest Service, U. S. Department of Agriculture, Washington 25, D. C.

JOHN W. DUFFIELD, *Silviculture*, % Forest Industries Tree Nursery, Nisqually, Wash.

S. R. GEVORKIANTZ, *Mensuration*, Lake States Forest Experiment Station, University Farm, St. Paul 1, Minn.

MARVIN D. HOOVER, *Forest Influences and Soils*, Division of Forest Influences, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

HARVEY J. MACALONEY, *Forest Pathology and Entomology*, Lake States Forest Experiment Station, St. Paul Campus, University of Minnesota, St. Paul 1, Minn.

RALPH W. MARQUIS, *Forest Economics and Policy*, Northeastern Forest Experiment Station, 102 Motors Avenue, Upper Darby, Pa.

CLARENCE W. RICHEN, *Forest Management and Engineering*, Crown Zellerbach Corporation, Public Service Building, Portland 4, Ore.

PHILIP C. WAKELEY, *Forest Genetics and Artificial Regeneration*, Southern Forest Experiment Station, 704 Lowich Building, 2026 St. Charles Avenue, New Orleans 13, La.

LEE E. YEAGER, *Forest-Wildlife Management and Recreation*, Colorado Cooperative Wildlife Research Unit, 243 Forestry Building, Colorado A & M College, Fort Collins, Colo.

LLOYD THORPE, *Advertising Representative*, Medical Arts Building, Seattle 1, Wash.

The JOURNAL OF FORESTRY, established in 1917, is the official organ of the Society of American Foresters, but the Society assumes no responsibility for the statements and opinions expressed by contributors.

Publication office, 425 Mills Building, 17th Street at Pennsylvania Avenue N. W., Washington 6, D. C. Address all correspondence concerning editorial or business matters to JOURNAL OF FORESTRY, 425 Mills Building, 17th Street at Pennsylvania Avenue N. W., Washington 6, D. C. Published monthly. Subscription $7.50 per year; single copies 75 cents. Missing numbers will be replaced without charge provided claim is made within thirty days after date of the following issue.

The editors are not responsible for loss or damage of manuscripts and photographs while in transit or in their possession. All material submitted for publication should be accompanied by return postage.

Copyright, 1955, by the Society of American Foresters. Entered as second-class matter at the post office at Washington, D. C. Acceptance for mailing at the special rate of postage provided for in the Act of February 28, 1925, embodied in Paragraph 4, Section 412, P. L. and R., authorized November 10, 1927.

CONTENTS

COVER: A portion of the H. J. Andrews Experimental Forest within the Willamette National Forest with the Three Sisters in the background. *Photo: U. S. Forest Service*

An Educational Project in Timber Management — *Jack B. Byers* 627

Some Contributions of the Cooperative Wildlife Research Units to Forest Wildlife Management — *Daniel L. Leedy* 630

The Effect of Pruning on the Height and Diameter Growth of Planted Slash Pine — *Frank A. Bennett* 636

Economics of Fire Detection in the South — *Albert C. Worrell* 639

Some Characteristics of Forest Floors From a Variety of Forest Types in California — *Joseph Kittredge* 645

Development of Second-Growth Longleaf Pine in South Mississippi — *Lloyd F. Smith* 648

Conversion of Weed Hardwoods to Conifers in the Northeast — *David B. Cook* 650

Forest Types and Conditions in Cuba — *Earl E. Smith* 655

Importance of Wood Quality in Tree Breeding — *Benson H. Paul* 659

The Responsibilities of a State Forest Entomologist — *William H. Bennett* 662

Notes 664

Props in Photogrammetry; How Tree Size Affects Time Needed to Prune Shortleaf Pine; An Example of Tree-Length Skidding as a Silvicultural Tool; Planting Conifers in the Higher Appalachians; Baldcypress on Theodore Roosevelt Island Planted.

Points of View 669

Comments on "Forest Production in a Dynamic Economy;" Comments on "The Role of a Regional Agency in Forest Fire Control."

Reviews 671

Soil and Water Conservation Engineering; Field Book of American Wildflowers; Influences of Reforestation and Erosion Control upon the Hydrology of the Pine Tree Branch Watershed 1941 to 1950; Geography of the Northlands; Composition of Scientific Words; Graduate Theses, 1944-1954; Knowing Your Trees; Publications of Interest.

Current Literature 674

Society Affairs 675

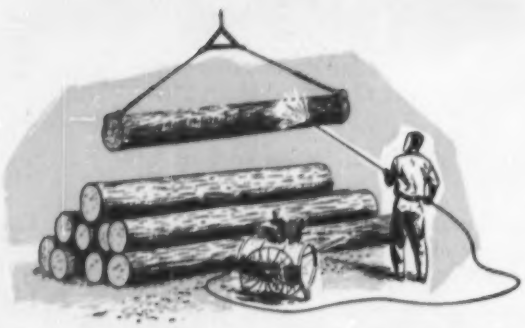
Forestry News 692

Index to Advertisers 704

HOW TO PREVENT

costly insect damage and stain

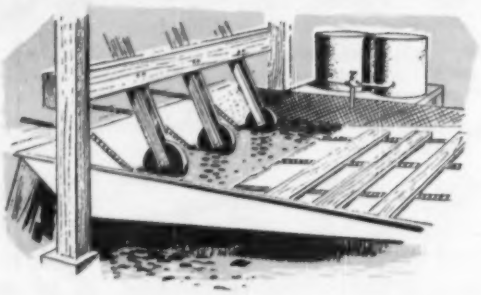
IN LOGS AND LUMBER



CHAPMAN AMBRITE

low-cost spray enables you to bank logs safely

- Effectiveness and economy proven by large and small mills everywhere.
- Protection is low in cost . . . usually less than $1.00 per 1000 ft. log scale, including labor.
- Reduces losses from degrade lumber because of damage by insects, stain or mold.
- Equally effective on hardwood and softwood logs.
- Sold in concentrated form for mixing as needed (mixed 1 to 19 with fuel oil).
- Applied with inexpensive portable sprayer.
- Available in 5-gallon cans and 55-gallon drums.



CHAPMAN AMBROCIDE

Effective insect control chemical for use on logs and lumber

- Chapman Ambrocide can be used three ways:
  1. Mixed with oil (1 to 19) for log spray to prevent insect damage . . . used when there is no stain problem.
  2. Mixed with water (1 to 19) for spraying untreated stacked lumber in the event of beetle attack.
  3. Mixed with Chapman PERMATOX 10-S and water (1 to 100) in dip tanks to prevent insect damage, sap stain and mold in lumber.
- Economical to use . . . provides positive protection.
- Available in 5-gallon cans and 55-gallon drums.

Write, wire or phone for prices and recommendations

CHAPMAN CHEMICAL COMPANY

Memphis 1, Tenn. • Portland 9, Ore.

CHAPMAN®

AMBRITE · AMBROCIDE

Journal of Forestry

Official Organ of the Society of American Foresters

An Educational Project in Timber Management

Jack B. Byers
Division of Forestry,
West Virginia University,
Morgantown

FORESTRY educators encounter many problems in their efforts to produce graduates capable of undergoing the transformation from students to foresters with a minimum loss of time for "breaking in" or gaining experience. Perhaps the largest problem results from the limited amount of time available in a four-year curriculum.

Few undergraduate professional curricula require more instructor-contact hours than forestry, due to the large variety of scientific and technical courses in the curriculum, the large amount of time consumed by field laboratory classes, and the constant pressure to liberalize the student foresters' education.

When the tidal wave of military veteran students subsided after World War II, and the younger nonveteran students who entered college directly from high school once more dominated the enrollment, the staff of the Division of Forestry of West Virginia University began to search for a way to prepare the students for that breaking in period when they take their first professional jobs.

A plan was developed with five basic objectives:

1. To give the student the opportunity to learn the ways of the logger in order that he may understand logging problems and methods.

2. To expose the student to the economics of the logging operation.

3. To help the student understand the relationship between research and the application of sound forestry practices.

4. To arrange for the student to participate in management, wildlife, and utilization work under conditions comparable to those he will work under during his professional career.

5. To provide the student with actual experience in the operation of a complete management project.

FIG. 1.—Students, professors, and the district ranger of the U. S. Forest Service are shown gathered around the sign which was installed in 1954, the fourth year of operation of the Meadow Creek Management Area.

Personnel from the Monongahela National Forest participated in planning the project and cooperate in carrying it through from year to year.

Stated simply, the plan was to set up a managed forest directed by a staff of foresters representing the fields of forest management, wildlife management, and wood utilization. Students would do all the work under the supervision of an elected student woods boss with guidance furnished by a forestry instructor and an experienced logger. Most important, the students would finance the operation with their own money and divide the profits among themselves.

The Project Described

Action started during the summer of 1951, when an 80-acre tract of mature white pine, white oak, and scarlet oak was set aside by the Forest Service under special use permit in the Meadow Creek watershed in northern Greenbrier County, West Virginia. The tract lies in the White Sulphur Ranger District of the Monongahela National Forest, within daily travel distance of Camp Arthur Wood, the University's summer forestry camp.

The Meadow Creek Timber Management Area, as it was called, was ideally suited to the plan. With timber volumes varying from 3 thousand to 25 thousand board feet per acre, the topography varying from level to deep gullied, and the ground varying from swampy to rocky, this single tract offered a surprising number of different combinations of forest conditions found within the state.

FIG. 2.—Students take measurements on the stump of a scarlet oak as the cutting crew proceeds to buck the bole into logs on an operation on the Meadow Creek Timber Management area.

Of the ten weeks in summer camp, the students spend about five weeks on this area, surveying, cruising for volume and growth, making reproduction studies and improvement cuttings, marking timber for cutting, making ecological studies, and operating the timber on a small-size cutting unit.

The heart of the project is the logging operation. The tract has been divided into four-acre cutting units, representing a 20-year cutting cycle, with one unit to be operated by the students each year.

In preparing for the operation, the students elect a supervisory committee, with the student woods boss as chairman. Members of the committee, although elected, are usually the students with the most previous experience in logging. This committee purchases the timber, plans the operation, and sells the product, under the guidance of the instructor and the logger, and subject to the approval of the student group.

Student Responsibility

After the students have surveyed and mapped the area, the district ranger, his assistant, and the instructor meet with the students at the cutting unit. Using maps the ranger discusses the management plan of the entire Meadow Creek watershed and ties it in with the plan in effect on the management area. Then the ranger twice conducts the group through the cutting unit. On the first trip he asks the students to assume that they are sawmill operators who need logs to supply their mill, and to argue with him for every desirable tree. On the second trip, during which the timber is marked for sale, the students are asked to assume that they are foresters responsible for the management of the area and to help the ranger select the trees to be marked on the basis of good forestry.

The more lively the arguments on both trips, the more successful the ranger has been, for his purpose is to make the students consider the problems from standpoints which may be directly opposed. Arguments are encouraged, and in fact are inevitable, for at this point the students are preparing to purchase the marked timber.

The timber is purchased under Forest Service regulations exactly as it would be purchased by any other operator. The purchase price is based on current prices realized from advertised timber sales in that area.

After the timber has been marked, during the period necessary to complete the sale, the students make a cut-and-leave tally which is used to compute the percentage of cut based on number of trees, board foot and cubic foot volumes, and basal area.

The instructor and the logger, who is employed by the University specifically for this purpose, instruct the students in the proper methods of maintaining their tools, cutting the timber, laying out roads, assembling log decks, and keeping themselves safe from accidents.

All the falling, and most of the bucking, is done with hand tools. In bucking power saws are used principally on small products such as pulpwood to speed up the operation. Work on the Meadow Creek Management Area is closely coordinated with the logging course required of all students during the following winter at the campus in Morgantown, where another logging operation is carried out in which power tools are used exclusively. We believe the student should learn to fall timber with hand tools before he uses power tools, because he not only learns the technique of falling better and quicker, but also develops a deeper respect for the tools.

Organization of the Work

The students are divided into six-man parties, each of which is sub-divided into two three-man crews, one operating as a timber cutting crew while the other gathers data on each tree felled. The data taken on each tree include crown measurements and classification; breast high measurements of diameter, bark, and growth; form class measurements; diameter measurements and growth measurements by decades at each place where the bole is bucked; defect data; and gross and net scaled volumes. Eventually these data will be used in the mensuration class and will serve to tie in the management area more intimately with classroom study.

As the cutting progresses the supervisory committee seeks markets for the logs. Offers for purchase are presented to the students who study them earnestly to determine which bid will give them the greatest return for their investment. In this area four different

log rules are used, and the method of scaling and deducting for defect varies with almost every operator. This opportunity for self-instruction would be lost if the students set up the conditions of sale themselves.

The conditions of sale have varied during the four years the project has been carried on. Each year the students have done all of the felling, bucking, and limbing; have laid out, swamped, and prepared all skid roads, truck roads, and landings; and have loaded the log trucks. In the third year the students also helped with the skidding under the supervision of the regular teamsters. In the fourth year the students did all of the skidding with truck-mounted winch and line using a head spar tree but no rehaul, and selling the logs on the landing. Chokers and slings, including the choker hook itself, were made in the camp blacksmith shop.

Safety is the first principle in the students' instruction and supervision. They are continuously reminded of the rules of safety laid down before they go on the job. They are not permitted on the job if they are tired. Tools that are not in good condition may not be used. Dull axes are banned. Felling crews are under constant observation to insure the safety of themselves and others.

The reason for the students doing all the work themselves is to insure that they understand the problems of the timber operator. Hence, they purchase the stumpage, sell the logs, and handle the money. If a truck breaks down or a tool is broken the students make the repair if it is within their capabilities and if the camp's shop facilities can handle it. Otherwise the students arrange for the repairs to be made elsewhere.

On completion of the operation, the student treasurer collects payment for the logs and divides the proceeds among the students, in cash.

Then the students enter upon the silvicultural phase of the work, which includes timber stand improvement on a cutting unit operated during the previous year. They make reproduction and other silvicultural studies, alternating between the management area and other areas which offer variations of timber type and condition. Wherever possible all these studies are referred to cutting operations, past, present, or future.

The results of this experiment have been satisfactory. It has provided many of the answers to the problems for which it was planned, and has created enthusiasm on the part of the participating students. The lessons they learn and the experience they gain are certain to be helpful, not only when breaking in on their first jobs, but throughout their professional lives.

❧❧❧

Attention: All Readers of the JOURNAL

The Society of American Foresters has a Committee on the History of Forestry (chairman, Edward N. Munns). To aid this Committee in its work, the Council of the Society has requested that the Committee make a survey of what is being written on the subject.

Readers of the JOURNAL can be of great assistance if they will notify the Committee promptly of any writing being done, either by themselves or others, on any phase of the history of forestry, whether articles, bulletins, or books. It will be helpful to know, in addition, the general nature or subject of the work.

The Council desires to have the information available at the Society's annual meeting in Portland, Oregon, October 16-19. Consequently, any response to this request will be appreciated.

The information should be sent direct to the chairman of the Committee, Edward N. Munns, 1639 Garnet Lane, Concord, Calif.

Some Contributions of the Cooperative Wildlife Research Units to Forest Wildlife Management

Daniel L. Leedy
Biologist in charge, Cooperative Wildlife Research Units, Fish & Wildlife Service, U. S. Department of the Interior, Washington, D. C.

Although the Cooperative Wildlife Research Unit Program is nation-wide in scope and has been in existence since 1935, it is probable that many readers of the JOURNAL OF FORESTRY *are unaquainted with the program's objectives and accomplishments. This paper was written at the suggestion of a S.A.F. member to provide such information.*

IN THE early 1930's, when the wildlife profession in the United States received much needed impetus by the publication of Aldo Leopold's *Game Management* and Herbert Stoddard's *Bob-white Quail*, "Ding" Darling was an Iowa conservation commissioner. In those days conservation commissioners were faced, as they are today, with multitudinous problems. "Ding" did not know the answers to many of these problems; neither did his staff. Not being one to admit defeat, however, he spear-headed efforts to initiate cooperative wildlife research projects at Iowa State College. He reasoned that with financial support, facilities, and encouragement on the part of the Iowa Commission, college specialists in pathology, zoology, botany, statistics, and other fields might devote some attention to wildlife problems and come up with answers of use in managing the state's resources. Selected graduate students could conduct research under guidance at low cost and learn at the same time. Upon graduation they would be available for employment by the state to carry out the management program. The idea worked in Iowa and when Mr. Darling became chief of the Bureau of Biological Survey (one of the predecessor agencies of the Fish and Wildlife Service) he and his successor, Ira N. Gabrielson, were instrumental in setting up cooperative projects on a nation-wide basis.

The Fish and Wildlife Service and the Wildlife Management Institute, during fiscal year 1935-36, entered into cooperative agreements with the land grant colleges and conservation departments of nine states located so as to represent various ecological and land-use types. Since that time other Cooperative Wildlife Research Units have been added until there are now 17 located as shown in Table 1.

The major objectives of the Cooperative Unit Program may be listed briefly as: (1) to facilitate the training of wildlife personnel, (2) to conduct research basic to managing wildlife resources, (3) to promote education through such means as demonstrations, lectures, and publications, and (4) to provide technical assistance to state conservation departments and other agencies in their wildlife management problems.

Administration of the Units

The individual Cooperative Units are administered by local coordinating committees which include representatives of the state conservation department, the state college or university, and the Fish and Wildlife Service. The Wildlife Management Institute, a fourth contributor, has designated the Fish and Wildlife Service as its agent in the administration of the Units. A Service biologist stationed at each Unit serves as Unit leader and directs and supervises the program formulated by the coordinating committee. This committee considers for approval the annual work program including research projects, budgets, number of fellowships to be granted, and any major changes in policy or personnel.

The coordinating committees meet quarterly or at such times as considered necessary to review the respective programs, iron out difficulties, and ensure progress. Each year preceding the North American Wildlife Conference, a national meeting of Unit cooperators—state, federal and private—is called by the Service biologist in charge of the nation-wide coordination of the Cooperative Wildlife Research Unit Program. The stock-taking and exchange of ideas at this meeting have proved very helpful in the operation of the individual Units.

Support of the Units

The pooling of manpower, funds, and facilities for common objectives has been one of the great strengths of the Cooperative Unit Program.

The state college or university provides office space, heat, light, and other facilities in addition to

TABLE 1.—LOCATION OF COOPERATIVE WILDLIFE RESEARCH UNITS IN THE UNITED STATES AND ALASKA

State or territory	Location	Date of unit establishment
Alabama	Alabama Polytechnic Institute, Auburn	October, 1935
Alaska	University of Alaska, College	March, 1950
Arizona	University of Arizona, Tucson	November, 1950
Colorado	Colorado A & M College, Fort Collins	October, 1947
Idaho	University of Idaho, Moscow	November, 1947
Iowa	Iowa State College, Ames	September, 1935
Maine	University of Maine, Orono	December, 1935
Massachusetts	University of Massachusetts, Amherst	September, 1948
Missouri	University of Missouri, Columbia	November, 1937
Montana	Montana State University, Missoula	June, 1950
Ohio	Ohio State University, Columbus	April, 1936
Oklahoma	Oklahoma A & M College, Stillwater	February, 1948
Oregon	Oregon State College, Corvallis	September, 1935
Pennsylvania	Pennsylvania State Univ., University Park	February, 1938
Texas	Texas A & M College, College Station	December, 1935
Utah	Utah State Agricultural College, Logan	November, 1935
Virginia	Virginia Polytechnic Institute, Blacksburg	September, 1935

the services of a secretary and one or more members of the instructional staff who are responsible for the formal training phases of the program. Goods and services thus supplied are budgeted at $6,000 per annum, but most institutions contribute beyond this stipulated figure. Many college staff members in addition to wildlife professors serve as advisors on projects involving pathology, statistics, biochemistry, nutrition, physiology, and other specialized fields. The expense of establishing wildlife research stations equipped with the various laboratories and staffed with the specialists already available at most universities would be prohibitive. With the encouragement of Unit staff members, many of these specialists who hitherto had devoted no time to wildlife problems are now helping solve them.

According to the terms of the Memorandum of Understanding under which the Units operate, the minimum cash financial contribution of the local state fish and game department is $6,000 annually. Most of the cooperating states provide much more than this and, in addition, make available for the Unit's use, vehicles, land, and other facilities.

The Wildlife Management Institute annually contributes $1,000 to each unit, which, together with the salary of the Fish and Wildlife Service biologist coming out of federal funds, makes up the other one-third of the minimum financial support of the Units. The Institute often finances additional fellowships involving research on problems of national interest. In general, however, the funds provided by the Institute are turned over to the Units with no strings attached and for that reason are exceptionally valuable for covering costs of meetings, out-of-state travel, and emergency purchases.

The Fish and Wildlife Service, in addition to paying the salary of the unit leader, provides each Unit with one or more automotive vehicles for official use and funds for field expenses and supplies in an amount dependent upon yearly appropriations. It also makes available various research facilities for the promotion of the program.

Although, when the Units were first organized, their total annual budgets were only about $18,000, most of the cooperators, particularly the state conservation departments, have increased their support until now some of the Unit budgets exceed $50,000. Even so, the amount spent by any one cooperator is relatively small considering the big job there is to do.

Some Unit Accomplishments

Having briefly reviewed the establishment, objectives, administration, and support of the Cooperative Units, let us now consider some of the accomplishments of the program with particular reference to forest wildlife management.

Training

In reading the list of colleges and universities at which the Units are located, members of the Society of American Foresters will have noted that many of these institutions are accredited forestry schools. Although colleges have not been accredited officially in the fish and wildlife field, certainly all of the Unit schools are recognized among the 50 or more institutions offering fish and wildlife training. With the establishment of the Units, most of the cooperating colleges and universities strengthened their wildlife training facilities by employing additional faculty members, initiating wildlife and related courses, and adding to their wildlife libraries. Prior to 1930 a large percentage of the conservation leaders of professional status were foresters and, of course, many of today's leaders are men with forestry training. Wildlife managers assigned to agricultural wildlife, waterfowl, or many other problems including basic zoological research, however, require a broader training than it is possible to obtain in most strictly forestry curricula; therefore it is probably well that a portion of the wildlife conservation training is centered in departments of wildlife conservation, zoology, or biology. The field of wildlife conservation is so broad and so much is expected of the wildlife manager that, if possible, he should be a specialist in several fields and a generalist with broad basic training at the same time. Furthermore, he should be adept at writing and speaking, and competent in public relations work. Establishment of Cooperative Units has not solved this problem of training but it has facilitated training, particularly at the graduate level.

From the dates the respective Units were organized through the 1952-53 school year, fish and wildlife majors have graduated from the 17 Unit schools in the following numbers: 1,450 with bachelors degrees, 480 with masters degrees, and 55 with doctoral degrees. Of these graduates, 70, 86, and 91 percent, respectively, have obtained positions in the wildlife and teaching fields or have returned to school for further training.

Fortunately, the Cooperative Unit Program was started early enough to provide a reservoir of trained men to fill important positions created by the Pittman-Robertson Act of 1937. This Federal Aid in Wildlife Restoration Program still represents the chief source of employment for the wildlife graduates although they have obtained employment throughout the country in federal, state and private conservation agencies.

Many students receiving higher degrees obtained Unit fellowships without which they would have been unable to complete their schooling.

While relatively few of these graduates have devoted full time to forest wildlife, a sizable number of them are in such work. Eight became Unit leaders and five are still in these positions. These men, together with others now serving as college professors in wildlife and related fields, guide and influence many future wildlife workers during their periods of training.

Research

Conducting research basic to the improvement of wildlife manage-

ment programs is one of the primary objectives of the Unit program. During 1953 nearly 250 projects were in progress at the 17 Units. These covered a wide array of subjects and included investigations on 19 species of game birds, in addition to waterfowl studies; 10 big game species; 8 fur animals; squirrels; rabbits; predators; disease; insecticides and wildlife; the Pacific walrus; habitats; and other problems. Fisheries work at many of the Units was carried out under the supervision of college staff members on funds contributed by the state conservation departments for that purpose.

Research projects are initiated after the most pressing needs have been discussed by the respective coordinating committees, Unit staff members and cooperators. Investigations are made by the Unit leaders, college staff members and graduate students, the latter under the supervision of Service and college biologists.

Although studies conducted by individual students are necessarily rather short-term investigations, some students have done research on a single problem for as long as 4 years. Also, in some instances, a student ready to begin work on his masters degree problem may work on a segment of a problem being conducted by another student. In this manner two or more students may work on different phases of a single problem over a period of years.

Unit staff members being more permanently located, are able to carry on long-term investigations. Thus, in Maine, Howard Mendall, Unit leader, had, in 1954, supervised waterfowl breeding ground studies for 16 consecutive years; and in Oregon, Arthur S. Einarsen has kept an eye on the pronghorned antelope since 1935. Pheasant studies have been conducted in Iowa and Ohio since the establishment of these Units.

Research findings have been applied by state and federal conservation agencies in various ways but perhaps most often in the establishment or revision of game laws, in game inventory work and in habitat management.

In the area of forest wildlife research, certain studies may be cited here as examples of those conducted by the Units.

Wild Turkey.—One of the first full scale studies of the Virginia Unit was an investigation of the eastern wild turkey. This resulted in a 281-page book, *The Wild Turkey in Virginia, Its Status, Life History and Management* by Drs. Henry S. Mosby and C. O. Handley, 1943. Robert D. McDowell, after having had experience with wild turkeys in Pennsylvania, resurveyed the status of turkeys in Virginia for a doctoral problem which he completed in 1954. The study added new facts about turkeys and important information on factors affecting harvest. Studies of the food habit, ecology, and management of the wild turkey by Pennsylvania Unit personnel have aided in extending the occupied turkey range in that state. Publications by Missouri workers have indicated that native wild turkeys are more productive than game farm strains and respond better to management. Leopold and Dalke (*23*) believed that overgrazing, overburning, slashing, and poaching were accountable for the decline of the species in Missouri. They found that relief from poaching produced prompt local gains.

Woodcock. — Due to their geographic location, the Units are able to make valuable contributions to our understanding of migratory birds such as the woodcock. The Maine, Massachusetts, and Pennsylvania Units have conducted studies of the ecology and management of this bird on its breeding ground, and Leslie L. Glasgow, a graduate student working in Louisiana out of Texas A & M College, has made detailed studies of the species on its wintering area. The 201-page booklet *The Ecology and Management of the American Woodcock* by Howard L. Mendall and Clarence M. Aldous, 1943, summarizes the early work done on the species in Maine. An ingenuous trap developed by the Pennsylvania Unit (*30*) with revisions such as those recently devised by Sheldon of the Massachusetts Unit, has been used widely in woodcock trapping and banding programs. Much progress has been made also in improving census techniques (*20*) with the result that more accurate data are available on woodcock populations, and hunting regulations can be established on a sounder biological basis.

Grouse.—The Idaho, Maine, Massachusetts, and Pennsylvania Units have current investigations on ruffed grouse to learn more about this species, its population dynamics, and management. A recent survey by a graduate student at the Massachusetts Unit (*12*) showed that about 27 percent of the licensed game bird hunters of the Bay State preferred to hunt ruffed grouse. Chapman, Bezdek, and Dustman (*10*) gave an interesting account of the ruffed grouse in Ohio, listing 17 management suggestions and urging Ohio hunters to harvest more of the surplus.

The blue grouse is receiving attention in Idaho, where, collectively the mountain areas are three times as extensive as farm-game habitats (*13*). An Idaho student (*8*) developed simplified procedures for distinguishing sex of these birds as well as obtaining other useful information.

The Columbian sharp-tailed grouse, at one time abundant on the grassy plains, benches, and foothills of northern and central Utah, declined in number until only 1,500 were estimated to remain in 1948. Personnel of the Utah Unit worked on the species over a period of 15 years and, in cooperation with the Federal Aid Division of the Utah State Department of Fish and Game, published a 79-page bulletin (*17*) calling attention to the plight of the sharptails and making suggestions to preserve the remnant flocks.

Other Game Birds.—In addition to pheasants which are receiving particular attention in Ohio, Oregon, and Iowa, studies also are currently in progress on the mourning dove (Alabama, Arizona, Ohio, Pennsylvania, and Utah), white-winged dove (Arizona) sage grouse

(Idaho and Utah) chukor partridge (Montana, Utah), European gray partridge (Oregon), band-tailed pigeon (Oregon), rock and willow ptarmigan (Alaska), Gambel quail (Arizona), scaled quail (Arizona and Texas), valley quail (Oregon), and bobwhite quail (Alabama, Iowa, Massachusetts, Missouri, Ohio, Oklahoma, Pennsylvania, and Virginia).

Although the bob-white quail is not usually considered a forest species, woodland management is important in its relation to quail productivity in the south. One of the earliest Texas Unit projects dealt with this problem and results of the study, still of much interest, were published as a bulletin of the Texas Agricultural Experiment Station (*22*). Virginia Unit studies of quail over a 9-year period indicates that up to 40 percent of the fall populations can be shot off without noticeable effect on next year's crop of birds. This is another bit of evidence pointing to the fact that game regulations can often be relaxed to permit greater harvests by sportsmen.

Deer.—Since they are widely distributed over the country, deer have been investigated by practically all of the Units. The black-tailed deer of western Oregon have been under investigation since 1940. In the early stages of the study, mature bucks taken from a recently burned area had an average hog-dressed weight of 213 pounds compared with 125 pounds for bucks taken from a closed canopy habitat (*14*). Analysis of plants which had sprung from the ashes of a recent burn showed high nutrient content especially in protein. The value to deer of recently burned or logged areas was well established by this study and the findings have been utilized in the management of the Oregon deer herds.

Utah Unit researchers conducting studies on the Rocky Mountain mule deer had by 1939 (*25*) concluded that "On present established ranges, the holding of deer populations to carrying capacity and limiting numbers by the removal of sufficient animals of either or both sexes is of primary importance." Also, Rasmussen (*26*), concluded that "obviously there can be little control of total numbers of deer by removal only of adult bucks," and Stoddart and Rasmussen (*29*) stated ". . . good deer and good livestock result from good land management. Every sportsman and stockman should strive for a better comprehension of what a good range consists of and how that range must be managed and protected if the deer herds and livestock herds are to continue to thrive. Even on areas where only livestock or only deer graze, still numbers must be limited and the herds managed on the basis of the range forage supply." More recent studies have corroborated these conclusions and have aided in bringing about more liberal seasons. As a possible means of improving critically over-grazed winter deer range in northern Utah, experimental browse plantings are being made and evaluated. In Montana, basic information is being obtained on the reproductive physiology of female mule deer, and regional variations in age composition and reproductive rates are being studied.

Taylor and Hahn (*31*), working out of the Texas Unit, called to the attention of conservationists and game managers the mass starvation of white-tailed deer (up to 116 dead deer per square mile) on the Edwards Plateau of Texas. Their sound arguments for herd reductions were undoubtedly of value in conditioning the minds of sportsmen to the desirability of providing doe seasons.

A current study in Missouri is concerned with the effects of timber stand improvement on deer browse. A study recently completed in Pennsylvania (*7*) showed seasonal browse patterns of species eaten by white-tailed deer. The deer browsed red maple heavily in winter, only; red oak in winter and in other seasons as well; and white ash, heavily in the summer but only lightly in winter. Other Pennsylvania studies deal with deer damage to coniferous plantings and the effects of deer browsing on clearcut, experimental management areas for ruffed grouse.

Elk.—A series of Utah Unit studies on the Cache and Mt. Nebo elk herds has provided valuable information on population status, productivity and effects of hunting on these large forest animals. The findings have been of use in regulating the hunting seasons. A current study in Montana is concerned with the food requirements of elk and the rating of various important forage plants for use in inventory work on elk ranges; another deals with the physiology of reproduction in elk. Cheatum and Gaab (*11*) found the determination of elk productivity by ovary analysis to be feasible particularly during the period immediately following fall breeding when the embryos cannot be readily found by ordinary field examination. A 1952 MS thesis, "A preliminary study of the Upper Selway River big game winter range with special reference to browse utilization," by Clay McCulloch, Idaho Unit research fellow, provided basic information on the utilization of redstem ceanothus and other preferred browse species for elk and deer and outlined possible management measures for this area.

Black Bear.—The black bear, now estimated to number 170,000 in the United States, (*18*) and becoming increasingly popular with hunters, is not so popular with the relatively few land owners who suffer crop damage or destruction of livestock by bears. L. B. Davenport, Jr., in a 1951 MS thesis, "The economic importance of the black bear in Virginia," clarified the extent of such damage in Virginia and provided information useful in the management of the species.

In Pennsylvania, a state that has given the utilization and management of the black bear considerable attention, it was found that acorns, beech nuts, apples and grapes are important fall, winter and spring foods and wild cherries the most important summer food (*5*). Foresters were urged to consider the value of wild cherries to bears and other wildlife in their forest management operations.

Sheep and Goats.—Bighorn sheep have received attention in recent years by the Idaho, Montana, and Utah Units. Results of a Montana project are summarized in a thesis: "A population study of the Rocky Mountain bighorn sheep (*Ovis canadensis canadensis shaw*) on Wildhorse Island" by H. A. Ogren (Montana State University, 1954).

Dwight H. Smith studied the bighorn in the Salmon River country as a student at the University of Idaho and, upon graduation, was employed by the Idaho Department of Fish and Game to continue his research on a Federal Aid Project. Results of the overall study were published as a State Bulletin (*28*). Lawson G. Sugden, Utah State student, is working on the California bighorn sheep in the Churn Creek Region of British Columbia.

Mountain goats have come under Unit investigation in Idaho and Alaska. Like Dwight Smith, Stewart M. Brandborg, leader of the Idaho goat project, continued his research for the state after receiving his MS degree at the University of Idaho and his findings are to be published soon in bulletin form. David R. Klein of the Alaska Unit, following a study of this prized game species, was able to recommend regulatory changes that would enlarge both the hunting and aesthetic values of the animal.

Fur Animals.—Among the forest dwelling fur animals studied by the Units are the beaver, fisher, marten, and raccoon.

Beaver studies in Alaska yielded information leading to the liberalization of the trapping season in the Kayukuk Management Area. In Colorado an inter-agency beaver study has shown that beavers, as well as deer, can and do eat themselves out of house and home with serious consequences to the habitat and to other resources.

In Maine, project leader Malcolm Coulter has found evidence that the fisher is extending its range to the east side of the Penobscot River and that this interesting fur animal not only eats red squirrels but also feeds on caches of beechnuts stored by red squirrels.

Marten research in Alaska, Colorado, and Montana has provided considerable information on this valuable fur animal. Dr. P. L. Wright of Montana State University is gathering data on marten density and distribution in Montana as correlated with vegetation types and food supply and is contributing to our knowledge of marten biology, life history and ecology.

Yeager (*32*) summarized results of some marten studies in Colorado. In Alaska, a Federal Aid-Cooperative Unit project yielded much information on the marten. The project leader, Calvin J. Lensink, concluded that management of individual trap lines on the basis of marten numbers, adult-juvenile ratios, and productivity, offers the most effective management tool. This system would operate on the same principle as waterfowl management on a fly-way basis. As Lensink pointed out, habitat management means preservation of the spruce forest which is the critical element in the marten's habitat, and control of forest fires, the most destructive agent, is already an internal part of the forestry program of the Bureau of Land Management and the U. S. Forest Service. More intensive measures of marten habitat management appear economically infeasible because of the vastness of the areas which are inhabited by marten.

The raccoon, a species which has increased greatly in numbers in recent years, has received attention at many Units. A series of studies by the Missouri Unit has provided information annually, since 1947, on population trends, sex and age ratios, and productivity of raccoons.

Predators.—Associated with the Iowa Unit, Paul L. Errington (*15*) has written one of the most comprehensive and widely quoted papers on predation yet to appear.

Foxes, so commonly accused of getting more than their share of game, have received considerable study. Numerous fox publications have been issued of which that of Scott (*27*), *Comparative Analysis of Red Fox Feeding Trends on Two Central Iowa Areas*, may be cited as an example.

Recently three Units have devoted attention to the bobcat. Pollack and Sheldon (*24*) in reporting on the bobcat in Massachusetts, stated that this animal was more abundant than it was 100 years ago, due primarily to reversion of much of the formerly open farm land to forest. These investigators found that a surprisingly large number of Massachusetts' sportsmen were becoming dyed-in-the-wool "cat" hunters and they recommended game status for this predator.

Donald R. Progulske, in his MS thesis, "The bobcat and its relation to prey species in Virginia" (Virginia Polytechnic Institute, 1952), estimated a Virginia bobcat population of perhaps 2,500. A bobcat food habits study is being conducted by the Alabama Unit.

The question of bounty systems was treated by Bennitt (*6*) in connection with coyote control in Missouri and by Latham (*21*) who, while leader of Pittman-Robertson Project 36-R at Pennsylvania State College, summarized much information he had obtained on the ecology and economics of predator management.

Smaller Mammals.—Early projects in both Ohio and Texas were concerned with the life history and management of the gray squirrel (*9, 16*). An Ohio fox squirrel project resulted in a series of papers on food habits, populations, trapping techniques, and squirrel dens (*1, 2, 3, 4*).

Hoover and Yeager (*19*) pointed out that the fox squirrel, although originally absent in Colorado, is now found in considerable numbers, locally, in the north central and northeastern part of the state. They found squirrel hunting pressure to be comparatively light despite the nongame, and therefore unprotected, status of the fox squirrel in Colorado.

Current studies include investigations of the gray squirrel in Pennsylvania and the Abert squirrel in Arizona.

The snowshoe hare is being studied in Massachusetts and Alaska. Cottontail rabbit projects are

being conducted at the Alabama, Arizona, Iowa, and Ohio Units. Rodents, generally, are being studied in Oklahoma, in relation to land management; and, in Pennsylvania, in relation to mast utilization.

Miscellaneous Forest Wildlife Projects.—Among other studies that might be mentioned here are those aimed to determine the effects on wildlife of controlled burning (Alabama), forest fires (Alaska), beetle-killed timber (Colorado), and thinning in cut-over forest lands (Idaho).

Education and Technical Assistance

One of the objectives of the Cooperative Wildlife Research Unit Program is to disseminate research findings through the publication and distribution of reports, bulletins, books, circulars, and journal articles. Since the inception of the program in 1935 more than 2,200 papers by Unit staff members and students have been published on a wide variety of topics. A few of these publications have been cited in this paper.

Many of the requests for wildlife information received by cooperating state colleges or conservation departments are referred to the respective Units. Other requests come directly to the Units.

Unit personnel, including graduate students, frequently lecture before sportsmen groups, garden clubs, and regional or national wildlife conferences. They participate in adult wildlife forums as held in Idaho and Montana, in conservation education programs for youth groups such as the Boy Scouts of America and 4-H Clubs, and in conservation laboratories for teacher training. They serve as instructors in several state conservation departments' in-service training schools and, in Alaska, Unit personnel help conduct a short-term school for military personnel.

Unit staff members also serve as technical advisors to state conservation department personnel, often attending departmental staff meetings and hearings of the state conservation commissions.

More detailed information regarding the over-all Unit program or the programs of individual Units may be obtained by writing the author or the respective Units. Since many of the Unit projects deal with forest wildlife, members of the Society of American Foresters are invited to get better acquainted with the Units. We can use your help and, at the same time, may be in a position to help you.

Literature Cited

1. BAUMGARTNER, L. L. 1938. Population studies of the fox squirrel in Ohio. Trans. 3rd N. A. Wildl. Conf. Pages 685-689.
2. ———. 1939. Foods of the Fox squirrel in Ohio. Trans. 4th N. A. Wildl. Conf. Pages 579-584.
3. ———. 1939. Fox squirrel dens. Jour. Mammal. 20(4):456-465.
4. ———. 1940. Trapping, handling and marking fox squirrels. Jour. Wildl. Mgt. 4(4):444-450.
5. BENNETT, L. J., P. F. ENGLISH, and R. L. WATTS. 1943. The food habits of the black bear in Pennsylvania. Jour. Mammal. 24(1):25-31.
6. BENNITT, RUDOLF. 1948. The coyote bounty system in Missouri. Trans. 13th N. A. Wildl. Conf. Pages 314-321.
7. BRAMBLE, W. C., and M. K. GODDARD. 1953. Seasonal browsing of woody plants by white-tailed deer in the ridge and valley section of central Pennsylvania. Jour. Forestry 51(11):815-819.
8. CAFFELL, E. B. 1954. A method for sexing blue grouse. Jour. Wildl. Mgmt. 18(1):139.
9. CHAPMAN, F. B. 1938. Summary of the Ohio gray squirrel investigation. Trans. 3rd N. A. Wildl. Conf. Pages 677-684.
10. CHAPMAN, F. B., HUBERT BEZDEK and E. H. DUSTMAN. 1948. The ruffed grouse and its management in Ohio. Wildlife Cons. Bul. No. 6, Ohio Div. of Cons. and Natural Resources. Pages 1-24.
11. CHEATUM, E. L. and J. E. GAAB. 1952. Productivity of north Yellowstone elk as indicated by ovary analysis. Special Report No. 2 (processed) Montana Coop. Wildl. Research Unit. Pages 1-5.
12. COUTURE, L. H. 1954. Seventy-four million dollars a year just for the fun of it. Bul. 14. Mass. Div. of Fish and Game. Pages 1-11.
13. DALKE, P. D. 1954. Blue grouse hunting in Idaho. Idaho Wildl. Review 7(1):10-11.
14. EINARSEN, A. S. 1946. Crude protein determination of deer food as an applied management technique. Trans. 11th N. A. Wildl. Conf. Pages 309-312.
15. ERRINGTON, PAUL L. 1946. Predation and vertabrate populations. Quarterly Review of Biology 21(2): 144-177.
16. GOODRUM, P. D. 1938. Squirrel management in east Texas. Trans. 3rd N. A. Wildl. Conf. Pages 670-676.
17. HART, C. M., O. S. LEE, and J. B. LOW. 1952. The sharp-tailed grouse in Utah, its life history, status and management. Publ. No. 3, Fed. Aid Div. of Utah State Dept. of Fish and Game. Pages 1-79.
18. HICKIE, PAUL. 1954. Inventory of big-game animals of the United States. Wildlife Leaflet 364 (processed) U. S. Fish and Wildlife Service. Pages 1-3.
19. HOOVER, R. L., and L. E. YEAGER. 1953. Status of the fox squirrel in northeastern Colorado. Jour. Mammal. 34(3):359-365.
20. KOZICKY, E. L., T. A. BANCROFT, and P. G. HOMEYER. 1954. An Analysis of woodcock singing ground counts, 1948-1952. Jour. Wildl. Mgt. 18(2):259-266.
21. LATHAM, ROGER M. 1951. The ecology and economics of predator management. Pittman-Robertson Project 36R, Report II, Pennsylvania Game Commission. Pages 1-96.
22. LAY, DANIEL W. 1940. Bob-white populations as affected by woodland management in eastern Texas. Bul. No. 592, Tex. Agric. Expt. Sta. Pages 1-37.
23. LEOPOLD, A. STARKER and PAUL D. DALKE. 1943. The 1942 status of wild turkeys in Missouri. Jour. Forestry 41:428-435.
24. POLLACK, E. M. and WILLIAM G. SHELDON. 1951. The bobcat in Massachusetts. Bulletin of the Mass. Coop. Wildlife Research Unit. Pages 1-24.
25. RASMUSSEN, D. I. 1939a. Utah's mule deer studies and management problems. American Wildlife Sept.-Oct. 1939.
26. ———. 1939b. Mule deer range and population studies in Utah. Trans. 4th N. A. Wildl. Conf. Pages 236-243.
27. SCOTT, THOMAS G. 1947. Comparative analysis of red fox feeding trends on two central Iowa areas. Research Bul. 353. Iowa Agric. Expt. Sta. Pages 427-487.
28. SMITH, DWIGHT R. 1954. The bighorn sheep in Idaho. Wildlife Bul. No. 1 Idaho Dept. of Fish and Game. Pages 1-154.
29. STODDART, L. A. and D. I. RASMUSSEN. 1945. Deer management and range livestock production. Circular 121, Agric. Expt. Sta. Utah State Agric. College. Pages 1-17.
30. STUDHOLME, A. T., J. D. BEULE and R. T. NORRIS. 1940. A study of Pennsylvania woodcocks. Pennsylvania Game News 11(11):6-7, 23, 30.
31. TAYLOR, W. P. and H. C. HAHN. 1947. Die-offs among the white-tailed deer in the Edwards Plateau of Texas. Jour. Wildl. Mgt. 11:317-323.
32. YEAGER, LEE E. 1950. Implications of some harvest and habitat factors on pine marten management. Trans. 15th N. A. Wildl. Conf. Pages 319-334.

The Effect of Pruning on the Height and Diameter Growth of Planted Slash Pine

Frank A. Bennett[1]
Southeastern Forest Experiment Station,
Cordele Research Center, Forest Service,
U. S. Department of Agriculture,
Asheville, North Carolina

ARTIFICIAL PRUNING involving five degrees of live-crown removal proved to have little or no effect on the height growth of planted slash pine (*Pinus elliottii*). Diameter growth, however, was affected if the crown ratio was reduced to less than 50 percent. These are the results of a study installed in 1948 by the staff of the George Walton Experimental Forest, Dooly County, Georgia.

Although the data from this study parallel the findings of most of the pruning studies of the past dealing with conifers, they help to fill a void insofar as slash pine plantations are concerned. Few facts dealing with pruning in slash plantations have been reported. With a large acreage of slash pine plantations already established and planting programs constantly expanding, the data presented in this paper should prove useful.

Methods

Since the objective was to test the effect of various degrees of live-crown removal on diameter and height growth, the following portions of live-crown were removed: none; 35 percent; 50 percent; 65 percent; and 80 percent. Treatments were replicated in five blocks of five randomized plots each. The plots contained an average of 36 trees, from which 10 were selected for treatment.

The study was established in two plantations: one 5 years of age and one 11. The younger plantation averaged 15 feet in height and 3.9 inches in diameter at breast height. Spacing was 10 by 10 feet. The older plantation averaged 30 feet in height and 7.6 inches d.b.h. Spacing was 15 by 15 feet.

All treatments were applied in the spring of 1948. Initial height and diameter measurements were taken at the time of treatment application. Heights in the younger plantation were measured with a 16-foot range pole; in the older, by abney level and chain. Remeasurements have been made annually at the end of each growing season.

Results

The data from this study have been analyzed for both periodic and individual year effect. Table 1 gives the average annual diameter and height growth for the first 4 years after pruning. Figure 1 presents the annual diameter growth graphically by treatment, year, and plantation. The various degrees of pruning also afforded an opportunity to measure the relation between growth and residual crown ratio. This relationship is portrayed in Figure 2.

Height Growth.—Table 1, depicting average annual height and diameter growth, reveals that pruning had little effect on height growth. Although the 4-year results showed a significant loss in the 5-year-old plantation for 65- and 80-percent pruning, analyses for individual year effect showed no significant differences until the second year, when trees with 65 percent pruning showed a loss significant at the 5-percent level. However, 80-percent removal reflected no significant loss. No further significant differences occurred in this plantation until the fourth year, when the 65- and 80-percent levels showed significant losses. The lack of a consistent pattern suggests that some uncontrollable factor other than pruning might be responsible for these differences.

No significant difference in height growth between treatments was found in the 11-year-old plantation. Apparently, loss in height growth as a result of pruning slash pine is not great enough to be of concern. This parallels the findings of McClay (*5*) and Young and Kramer (*9*) with respect to loblolly pine.

Periodic Diameter Growth.—Inspection of Table 1 shows that over the 4-year period the 5-year-old plantation lost an average of only 0.02 inch in diameter growth for 35-percent live-crown removal when contrasted with unpruned trees. This represents a 3.5-percent loss. The 11-year-old plantation shows a 10 percent loss for the same treatment. For 50-percent-live-crown removal the younger trees show an 8.8-percent loss, while the older ones show a 20-percent reduction. Beyond 50-percent removal, loss in diameter growth for the 4-year period is pronounced in both plantations, and is consistently greater among the older trees.

Annual Diameter Growth.—Figure 1 presents the annual diameter growth made by the various treatments for each of the 4 years after pruning. All degrees of pruning resulted in some loss of diameter growth during the first year. Growth losses were still pronounced in the second year, but distinct recovery occurred in the third and fourth years.

During the fourth year after pruning the younger trees showed

[1]Thomas C. Evans, station statistician, is gratefully recognized as rendering invaluable guidance in the statistical analysis of the data.

TABLE 1.—AVERAGE ANNUAL DIAMETER AND HEIGHT GROWTH FOR 4-YEAR PERIOD AFTER PRUNING

Percent live-crown removal	Diameter growth		Height growth	
	5-year-old plantation	11-year-old plantation	5-year-old plantation	11-yearold plantation
	Inches		*Feet*	
0	0.57	0.50	3.92	3.21
35	0.55	0.45**	3.84	3.26
50	0.52*	0.40**	3.84	3.28
65	0.44**	0.30**	3.66**	3.19
80	0.40**	0.26**	3.59**	3.27

*Significantly different from control trees at 5-percent level.
**Significantly different from control trees at 1-percent level.

no significant loss from any treatment, whereas the older ones suffered significant losses at the 65- and 80-percent levels of pruning. Thus the effect of pruning was more severe and lasted longer in the older plantation than in the younger.

Relation of Diameter Growth to Crown Ratio.—Within each treatment, the range of residual crown ratios was very small. This suggests that crown ratio might be substituted for the less practicable term "percent live crown removed." The relation between diameter growth and residual crown ratio is portrayed in Figure 2. The growth rate climbs rapidly with increase in crown ratio until the 50-percent level is attained. Beyond this the increase is gradual. Labyak and Schumacher (*4*) found this to be true for loblolly pine.

Although the two plantations have about the same growth pattern in relation to crown ratio, the growth rate between the plantations varies considerably. This is explained to some extent by the fact that competition was greater in the older one. The younger trees, for example, had a crown ratio of 89 percent at the time of treatment application, while that of the older trees was only 72 percent.

Discussion

Results of the study suggest that pruning in young stands should not remove more than 35 percent of the live crown if loss in diameter growth is to be avoided. Indications are that a crown ratio of 50 percent should also be maintained if possible. Both points agree substantially with Bull's (*1*) recommendations for pruning longleaf. The two points also support the idea of two prunings instead of one to reach the 17-foot level for one clear log. This is no new idea. Hawley and Clapp (*2*) advocated this method in 1935, and Hawley and Lutz (*3*) in 1943. Bull (*1*) supports the idea of repeated prunings for longleaf and so does Wahlenberg (*8*).

In the younger plantation, removing 35 percent of the live crown

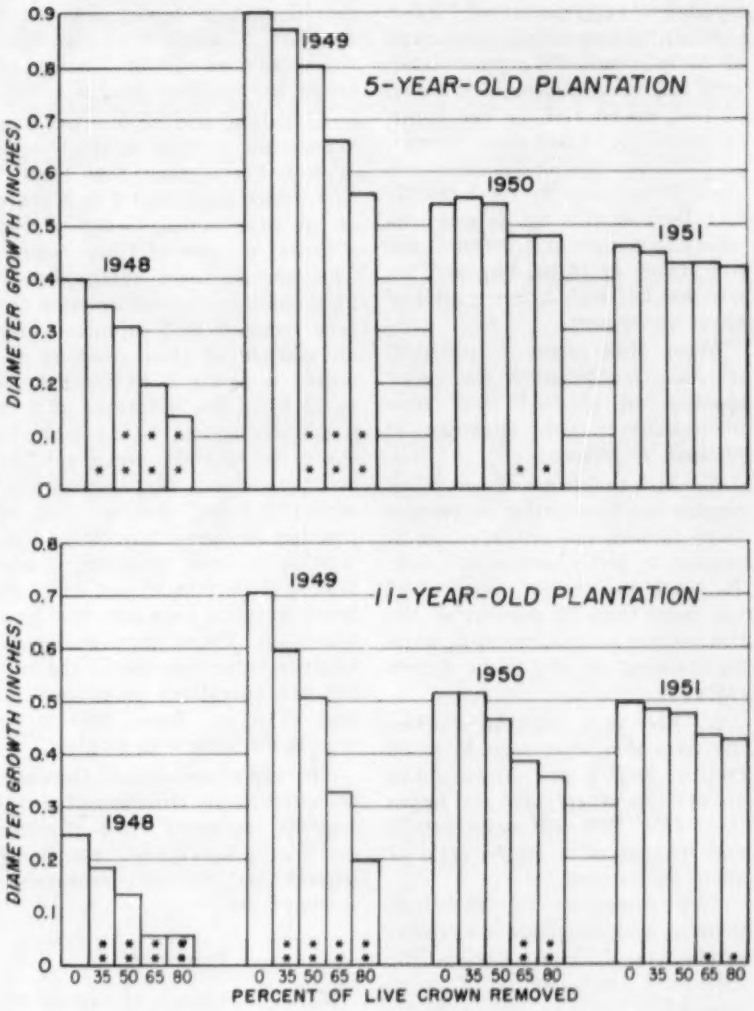


FIG. 1.—Annual diameter growth, by various treatments, for the two plantations. Single star (*) indicates significantly different from control trees at the 5-percent level; double star (**) significant at 1-percent level.

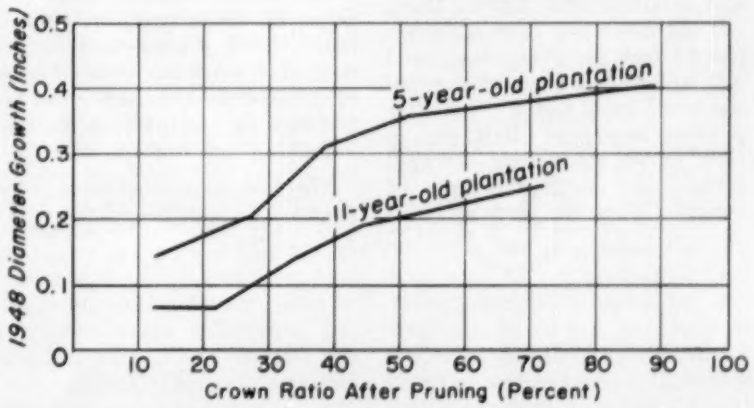

5-year-old plantation
11-year-old plantation
1948 Diameter Growth (Inches)
0 0.1 0.2 0.3 0.4 0.5
10 20 30 40 50 60 70 80 90 100
Crown Ratio After Pruning (Percent)

FIG. 2.—Relation of 4-year diameter growth to crown ratio after pruning.

resulted in a cleared bole of 7.3 feet and left the tree with a crown ratio of 50 percent. Five years later, with heights averaging better than 33 feet, the base of the live crown had moved to 14 feet above ground, and the average crown ratio was about 60 percent. To reach the 17-foot level at this age it was necessary to remove only 3 feet of the live crown, or 16 percent, and the tree was left with a crown ratio of about 48 percent.

From these facts a practical schedule for pruning the wider spacings of old-field slash pine plantations on good sites can be phrased as follows:

1. At 5 to 6 years of age, when heights can be expected to average 15 to 18 feet, and crown ratios 85 percent or better, prune to 8 feet. To reach this height, removal of not more than 35 percent of the live crown is recommended while maintaining a 50-percent crown ratio.

2. Five to 6 years later, when the trees should average 33 to 36 feet in height and crown ratios about 60 percent, return and prune to 17 feet. This will again permit maintenance of a crown ratio of about 50 percent.

The advantage of two-phase pruning over one-phase is a greater production of clear material. The 5-year-old trees, we recall, averaged 3.9 inches d.b.h., while the 11-year-old trees averaged 7.6 inches. Thus there is a difference of 3.7 inches in the size of the knotty core after pruning. In addition, knots in the younger trees are smaller and will heal over faster. Mann (*6*) has shown that in stands growing 0.3 inch per year, clear wood will be formed 4 years after pruning small knots and 6 years after pruning large ones. Both plantations in the study have averaged better than twice this rate of growth. Thus the younger trees should start producing clear wood at about 5 inches d.b.h., whereas the older ones will be 9 inches or larger before clear wood is added.

As to the cost of one pruning versus two, records on the George Walton Forest show that trees 3 to 4 inches d.b.h. and 5 to 7 years of age were pruned to a height of 8 feet at the rate of 1 per minute. The laborers were admittedly of high quality. Depending upon the type labor, 4 to 9 minutes—with an average of about 7—were required to prune 6- to 8-inch trees to 17 feet. The difference of 5 to 6 minutes should be adequate to cover the second operation. The Southern Forest Experiment Station (*7*) found that the cost of pruning increased directly in proportion to tree diameter. Their figures show that it cost twice as much to prune an 8-inch tree as a 4-inch one. Therefore, there should be little or no increase in the cost for two operations as opposed to one. Bull (*1*) found this to be true in his work with longleaf.

The two-phase method thus satisfies the major objective of pruning—an increased yield of clear material—without sacrificing growth and without measurably raising costs.

Summary

To test the effect of various degrees of live-crown removal on height and diameter growth of planted slash pine, five treatments were applied to five blocks of 50 trees each. The portions of live-crown length removed were: (1) none; (2) 35 percent; (3) 50-percent; (4) 65 percent; and (5) 80 percent. To test the effect on trees of different ages, the study was established in two plantations—one 5 years of age and one 11.

The following conclusions were drawn from analysis of the data:

1. Pruning up to 80 percent of the live crown has little or no effect on height growth of planted slash pine.

2. In the 5-year-old plantation, with an average crown ratio of 89 percent, removal of 50 percent or more of the live crown resulted in a significant reduction in diameter growth.

3. In the 11-year-old plantation, with an average crown ratio of 72 percent, removal of 35 percent or more of the live crown resulted in a significant reduction in diameter growth.

4. Diameter growth increases rapidly with an increase from 10 to 50 percent in crown ratio, but beyond 50 percent the increase is very gradual.

A practical schedule for 2-step pruning in the wider spacings of planted slash pine on good sites is outlined.

Literature Cited

1. BULL, HENRY. 1943. Pruning practices in open grown longleaf pine in relation to growth. Jour. Forestry 41:174-179.
2. HAWLEY, R. C. and R. T. CLAPP. 1935. Artificial pruning in plantations. Yale Univ., School Forestry Bul. 39.
3. ———— and H. J. LUTZ, 1943. Establishment, development, and management of conifer plantations in the Eli Whitney Forest, New Haven, Conn. Yale Univ., School Forestry Bul. 53.
4. LABYAK, L. F. and F. X. SCHUMACHER. 1954. The contribution of its branches to the main-stem growth of loblolly pine. Jour. Forestry 52:333-337.
5. MCCLAY, T. A. 1953. The relation of growth to severity and season of pruning of open-grown loblolly pine. Jour. Forestry 51:287-288.
6. MANN, W. F., JR. 1952. Loblolly pruning scars heal rapidly. South. Forest Expt. Sta. Forestry Note 77.
7. SOUTHERN FOREST EXPERIMENT STATION. 1951. Annual Report. p. 28.
8. WAHLENBERG, W. G. 1946. Longleaf pine. Charles Lathrop Pack Forestry Foundation and United States Forest Service. Illus. Wash., D. C.
9. YOUNG, HAROLD E. and PAUL J. KRAMER. 1952. The effect of pruning on the height and diameter growth of loblolly pine. Jour. Forestry 50:474-479.

Economics of Fire Detection in the South

Albert C. Worrell[1]
Associate professor of forest economics,
Yale University, New Haven, Connecticut

THE Georgia Forestry Commission annually expends a sizeable part of its fire control budget for fire detection. With the hope of effecting economies in this important function, the Commission underwrote, during the summer of 1954, an economic study of its fire detection system. Part of the results are presented in this article. This portion of the study was confined to the Commission's First District, consisting of fourteen counties in Southeast Georgia. Conditions in this district are typical of the extreme lower Piedmont and the Coastal Plain flatwoods.

Fire Occurrence Pattern

The number of fires which occur in a given period of time varies with the season of the year, the fire danger class of the day, and the time of day. The critical fire season in Georgia District I is between mid-December and the latter part of April. Controlled burning also is concentrated in this period. In some years—as in 1954—serious fire situations develop at other seasons, but on the average the bulk of the fires occur in late winter and spring. The analysis in this article is confined to this season.

Number of forest fires is closely related to fire danger rating of the day. This is shown in Table 1 by the average number of fires per day during the 1954 season. The number of controlled burns also increased with class of day, but not as rapidly as the number of wild fires. At first glance, this would seem to indicate that most fires occur on Class 5 days. But there are not equal numbers of the different class days in a fire season. Table 1 shows that in 1954 only 5 percent of the spring days rated as Class 5 while 43 percent rated as Class 4. Class 3 days were almost as common as Class 4. The important figures are those in column three—the percent of the fires which occurred on different class days. Two-thirds of the fires were on Class 4 days and three-fourths were on either Class 4 or 5 days.

TABLE 1.—RELATION OF FOREST FIRES TO DANGER CLASS OF DAY IN BULLOCH AND SCREVEN COUNTIES, GEORGIA, IN 1954

Fire danger class	Percent of days	Percent of fires	Average number of fires per day	
			Wild fires	Controlled burns
1 & 2	15	1	0	3
3	37	23	0.7	8
4	43	64	1.7	11
5	5	12	2.7	14

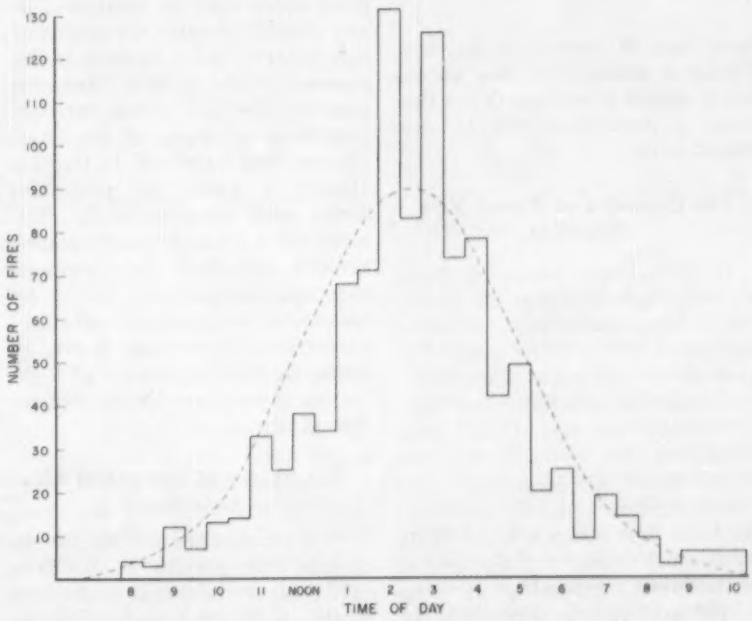


FIG. 1.—Hourly distribution of wild fires during 1954 season.

Forest fires are not evenly distributed throughout the day but tend to bunch up in the afternoon. The distribution of fires during the 1954 season by the time at which they were reported is shown in Figure 1. The mean time of day for all fires was 2:30 p.m., and the number fell off sharply both earlier and later in the day. This fire occurrence forms almost a normal frequency distribution as shown by the dotted curve in Figure 1. Individual counties had the same pattern, though their distributions were not as close to normal because of fewer fires. It seems safe to assume an approximately normal distribution which enables us to estimate the percent of the fires which will occur at different times. These estimates are shown in Table 2 by 2½ hour periods centered around 2:30 p.m.

Forest fire occurrence varies from a high rate per hour in mid-afternoon on Class 5 days to an almost negligible rate at night on Class 1 days. If the detection organization is to be efficient, it must match this occurrence pattern. In District I only one percent of the fires occurred on Class 1 and 2 days and five percent at night. In both cases the occurrence per hour is low and the cost of maintaining a detection system to catch these few fires is relatively very high. It appears impracticable to try to detect

[1]The study reported on here was conducted while the author was a member of the faculty of the School of Forestry, University of Georgia.

TABLE 2.—DISTRIBUTION OF FIRES BY TIME OF DAY IN GEORGIA DISTRICT I

Time interval	Percent of fires
1:15- 3:45 p.m.	38
12:00- 1:15 p.m. 3:45- 5:00 p.m.	30
10:45-12:00 noon 5:00- 6:15 p.m.	18
9:30-10:45 a.m. 6:15- 7:30 p.m.	9
Before 9:30 a.m. After 7:30 p.m.	5

more than 94 percent of the fires during a season. Whether an attempt should be made to detect this large a percentage will be discussed later.

The Objective of Forest Fire Detection

It is obviously impossible from an economic standpoint for a protection organization to detect every fire which burns in its area. The goal of the detection effort therefore must be something less than 100 percent coverage. Under these conditions, the desirable objective is to detect the potentially most damaging fires and leave undetected those fires which are not likely to do much damage. The output of a detection organization in terms of potential damage detected is difficult to quantify. So in the following analysis output is expressed in terms of the percent of the fires during the season which are detected. This will be qualified somewhat by recognizing that fires which burn at certain times have a greater damage potential than those burning at other times. But in order to simplify the analysis, two assumptions had to be made: (1) that fires are uniformly distributed over the area geographically, i.e., there are no "hot spots", and (2) that there is no geographical differences in the potential damage by fires, i.e., a fire at any one place is potentially as dangerous as a fire at any other place. Neither of these assumptions are too far from reality in District I but they will not hold in a great many other areas.

A third assumption is also implied which must be considered in any attempt to apply the results of this study to other sections of the country. This is that discovery time can be held within satisfactory limits with any of the detection systems described. In Georgia District I where the protection forces have complete radio communication between towers, planes, vehicles, and office; where suppression equipment is very mobile by means of transport trucks; and where most forest land is readily accessible from a network of highways and woods roads, this assumption is true.

The Nature of Tower and Air Detection

When towers are used for fire detection, the percent of the fires which are seen depends on the area visible from the towers. This assumes that towers are manned all day and every day when fires might occur. For example, if the whole area were visible from the towers and they were manned from 9:30 a.m. to 7:30 p.m. every day during fire season, according to Table 2 the tower watchmen would see 95 percent of the fires. If they were manned the same hours and number of days but could see only half of the area, then they would see only 47.5 percent of the fires.

If towers alone are used for detection and they are well located, the percent of the fires seen can be increased only by installing more towers. Figure 2 shows the relation between the desired percent of the fires and the number of towers required per thousand square miles. In this graph the towers are located independently for each different number used. That is, when there are two towers they are located to give the maximum coverage. When three are used, the third is not just added to the existing two, but all are located so as to get the best possible coverage with three towers. (Figure 2 is based on an assumption that each tower can see a perfect circle with an eight mile radius. Few towers see perfect circles and the radius varies with haze. However, this graph shows the basic relationship between number of towers and percent of fires visible). Figure 2 shows that as an attempt is made to push detection toward 100 percent, the number of towers required increases more rapidly than does the coverage. Beyond 90 percent the number of towers required increases very rapidly because most of the area seen by each added tower is already visible to existing towers and the total coverage is increased only slightly.

A characteristic of tower detection which should be noted here is that adding more towers increases the proportion of the fires detected in an areal and not in a time sense. That is, the additional tower increases the percent of the fires seen on Class 2 days and early morning by the same amount as it does those in the more dangerous Class 5 and mid-afternoon periods. In order to detect all of the Class 5 day fires by towers alone, the whole area would have to be visible to the tower system.

When air patrol is used for detection, the percent of the fires seen will depend on the time the plane spends in the air. This assumes that the plane can cover its assigned area and see any smoke which arises while it is in the air.

If air patrol alone is used, the

TABLE 3.—PERCENT OF FIRES VISIBLE TO AIR PATROL PER HOUR FLOWN

Time interval	Class of day			
	5	4	3	1 & 2
	Hundredths of one percent			
1:15- 3:45	31	21	9	1
12:00- 1:15 3:45- 5:00	24	16	7	0.7
10:45-12:00 5:00- 6:15	15	10	4	0.5
9:30-10:45 6:15- 7:30	7	5	2	0.2

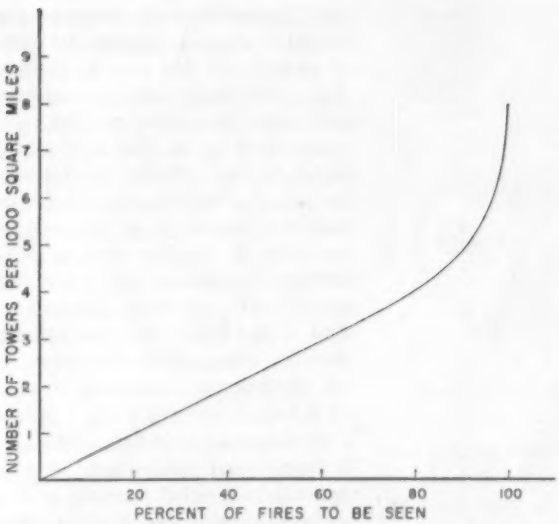


FIG. 2.—Number of towers required for various detection coverages.

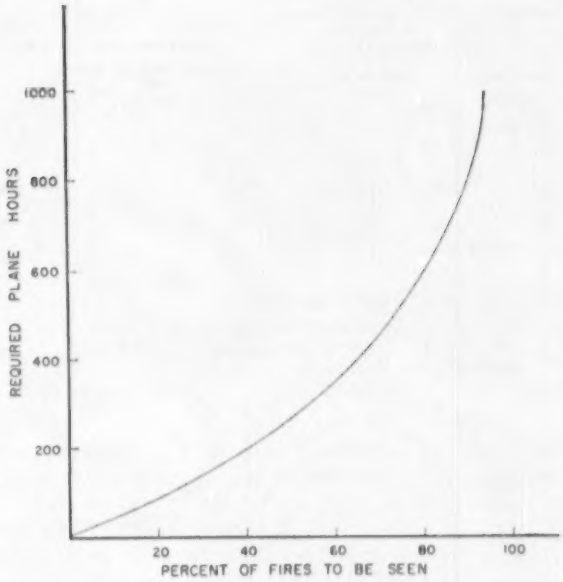


FIG. 3.—Air patrol time required for various detection coverages.

percent of the fires seen can be increased only by flying more hours. However, since fire occurrence is not uniform, the number of smokes which an air patrol will see and check per hour depends on the particular hours it flies. This is shown in Table 3 where the percent of the fires in District I during the season is subdivided by class of day and time of day. During each hour of air patrol between 1:15 and 3:45 p.m. on Class 5 days, the plane sees an average of 0.31 percent of all fires which occur during the season. By contrast, during each hour flown between 10:45 a.m. and noon on Class 3 days it sees only 0.04 percent of the season's fires. The patrol is eight times as efficient—measured in percent of fires seen per hour flown—in the first period as in the latter.

Since in general the periods of greatest fire occurrence are also those of greatest potential damage, the efficiency of the plane varies even more from period to period than the number of fires seen per hour flown would alone indicate. It is characteristic of air patrol that if the detection coverage is expanded as described in the next paragraph, this coverage will be concentrated first on those periods when damage is potentially the greatest.

If only a limited amount of money is available for air patrol, it is most efficient to fly between noon and five o'clock on the Class 5 days. If more patrolling can be financed, the next most efficient time to fly is from noon to five p.m. on the Class 4 days. Then the patrol should be extended to 10:45 a.m. and 6:15 p.m., first on Class 5 and then on Class 4 days. Only after all of this time is being flown will it be efficient to do any flying on Class 3 days and then only between 1:15 and 3:45 p.m.

If air patrol is being used during the periods when most fires occur, the percent detection can be increased by flying during other periods. But since there are fewer fires in these, the detection cost per fire will be higher than in the first period. Figure 3 shows that the percent of the fires detected can be pushed closer and closer to 100 by flying more and more hours. But as the coverage approaches 90 percent, the plane must fly a great many hours in order to see the additional fires. The cost of increasing detection coverage further rises very rapidly once a large part of the fires have been seen.

Detection by Combined Towers and Air Patrol

Air patrol is quite flexible—it can be used for scattered short periods and payment made only for the time actually flown. (The total number of hours flown in a season must, of course, be enough to interest someone in contracting to do the flying.) But a tower system is not flexible. Once towers are erected and equipment and radios installed, depreciation and maintenance costs go on whether they are used or not. When tower watchmen are paid by the month, it is not even possible to save on wages by taking watchmen down during air patrol, except in the rare cases where they can be put to other constructive work. It is, therefore, most economical to man an existing tower system full time during fire season.

While a tower system is manned, air patrol is bound to give much duplicate coverage. The plane cannot patrol just the areas invisible to the towers. While doing so the areas visible from the towers are also observed. An example will show the effect of this. Suppose we desire to detect 90 percent of the fires in a protected area but existing towers permit coverage of only 80 percent of the area. Air patrol is used to raise the coverage from 80 to 90 percent. To do this, the plane must fly enough hours so that 50 percent of the fires are seen from it. The tower watchmen al-

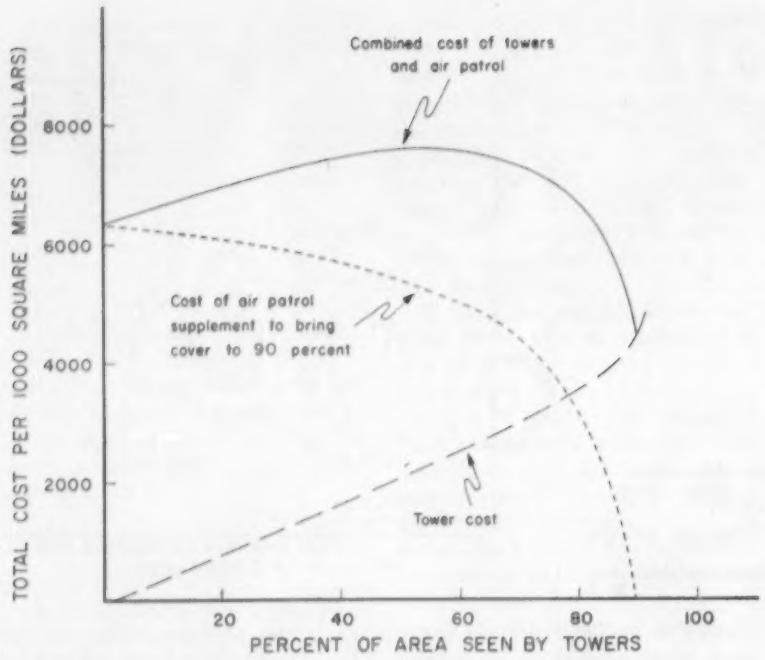


FIG. 4.—Total cost per thousand square miles of 90 percent detection coverage with various combinations of towers and air patrol.

ready are seeing 80 percent of the fires visible from the plane. So of the 50 percent seen from the plane, 40 percent would have been seen from the towers anyway. While detecting 50 percent of the fires the air patrol actually raises total coverage by only 10 percent. The total number of fires reported will be 130 percent of those burning, but only 90 percent of the fires will actually be seen.

This problem of duplication is illustrated in Figure 4. The dashed line shows the cost of the tower system needed to see various percentages of the protected area. The dotted line shows the cost of supplementary air patrol required to bring total detection coverage to 90 percent with various tower coverages. The solid line shows the combined cost. Figure 4 assumes a seasonal cost of $800 for each tower and an hourly cost of $8.00 for air patrol. At these costs it would be cheapest to get the desired 90 percent detection by using all towers and no air patrol. Any combination with air patrol would be more expensive. If tower costs were higher and air patrol costs lower, this situation would be reversed and it would be cheaper to use all air patrol and no towers.

Because air patrol cannot be completely substituted for part of the tower system when combined with towers, it will cost more to use a combination than to use all of one or the other. There is an exception to this rule, however, which makes it economical to use a combination of air patrol and towers under certain conditions. If, when air patrol is also being used, the average cost of the towers in the combination can be reduced sufficiently from the average cost of towers used alone, some combination may be cheaper than the use of one method alone.

Tower Cost When Combined with Air Patrol

When towers alone are used for detection, someone must check every smoke seen to determine whether it is a wild or controlled fire. If the number of fires in a protected area is small, the tower watchmen may check smokes themselves or one crew on the ground may check smokes for several towers. The number of towers needed to get a desired percent detection is as great in this case as if there were many fires, but the personnel and vehicles needed to check the smokes are fewer. The only saving which can be effected in this case by using a combination of towers and air patrol is in the cost of travel by the vehicles used to check smokes. Only the actual travel cost would be saved, since maintenance and depreciation on the vehicles and the wages of the patrolmen go on whether the smokes are checked or not.

If the number of fires in the area is large—and particularly if there is much controlled burning so that smokes have to be checked, even though most of them are not wild fires—the situation is different. If towers alone are used here, there must be a watchman in each tower and a man on the ground for practically every tower to check smokes. In this case, the average cost per tower must include the cost of the patrolman and his truck. When a combination with air patrol is used, there are, for all practical purposes, two men and a truck standing idle at each tower while the plane is in the air. (The use of the patrolmen for suppression will be discussed later). These people are needed to detect and check smokes which occur when the air patrol is not flying. Since the plane may fly only a few hours a day, it is not feasible to remove them from the payroll for the hours when there is air patrol.

A solution to this problem exists in the form of a calculated risk. If air patrol is used during the periods when fire occurrence is greatest, the tower system will have fewer smokes to cope with during the time it is handling detection alone. This is shown in Table 4, based on a typical county which had 220 wild fires during the 1954 season. In this county, on the average Class 5 day the detection system must handle 11 smokes—of which 1.7 are wild fires—during the 2½-hour period between 1:15 and 3:45 p.m. By contrast, on the average Class 3 day during the same 2½-hour

period there are only 6 smokes and only 0.5 of these are wild fires. If air patrol were used from noon to 5:00 p.m. on all Class 4 and 5 days, the plane would fly 265 hours and see 51.7 percent of the fires during the season. The worst occurrence left for the tower system to handle alone would then be on the Class 5 days from 10:45 a.m. to noon and 5:00 to 6:15 p.m. when an average of 5 smokes and 0.8 wild fires can be expected per day. If there were five towers in the protected area, each watcher would see only one smoke during this 2½-hour period and only one of them would have a wild fire. The detection load would be even less during other periods, as Table 4 shows.

TABLE 4.—PERIODS OF THE FIRE SEASON IN DECREASING ORDER OF FIRE LOAD

Class day	Time interval	Average number per day		Accumulative[1]	
		Wild fires	All smokes	Percent of fires	Plane hours flown
5	1:15- 3:45	1.7	11	4.6	15
5	(12:00- 1:15) (3:45- 5:00)	1.3	8	8.2	30
4	1:15- 3:45	1.1	8	32.5	148
4	(12:00- 1:15) (3:45- 5:00)	0.9	7	51.7	265
5	(10:45-12:00) (5:00- 6:15)	0.8	5	53.9	280
4	(10:45-12:00) (5:00- 6:15)	0.6	4	65.4	398
3	1:15- 3:45	0.5	6	74.1	498
3	(12:00- 1:15) (3:45- 5:00)	0.4	5	81.0	598

[1]Based on distribution shown in Table 3.

With air patrol available during the worst periods, it is possible to combine detection and checking at the towers in one person. That is, towers can be manned with patrolmen who leave them to check smokes. When the plane is flying it will check most of the smokes and can be notified by the dispatcher to move in and cover an area where a tower is unmanned. When the plane is not flying, the risk is taken that another fire might occur while the patrolman is away from the tower. If the plane flies enough of the worst periods, this risk is not excessive because of the low fire occurrence during the remaining time. During the critical periods of high fire occurrence and great potential damage, the towers and planes will work together to speed up detection time. The towers will have the detection job alone only in periods of lower potential damage when rapid detection time is not so essential.

Reduction of personnel as a calculated risk based on part-time coverage by air patrol is the only way detection and checking costs can be reduced by combining towers and air patrol. The ranger and the dispatcher must then keep in touch with the situation at all times and shift personnel and equipment as needed to keep the county covered. It is not economically feasible to have every part of every county prepared at all times for the worst fire outbreak which might occur. A check of the fire records shows that fires not only do not pile up in all counties on the same day but also do not pile up in all parts of a county on the same day. On only three days in spring 1954 would the county with the worst fire load have been pressed for cover if all towers had been manned with patrolmen except the central dispatch tower. On these days the county was covered by air patrol.

Each protection unit must have some minimum force available to suppress fires. This number of people and the equipment for them must be provided regardless of how the fires are detected. If some of these suppression people can be used to check fires, then it is not necessary to hire patrolmen. A county which has a large number of fires must maintain a large suppression force during fire season. Except when actually fighting fire, these people have little to do. Depending on the number of fires which normally occur in the county, one or more crews may be held in absolute reserve for suppression only. The others can be distributed to check smokes for the towermen. Since these people must be hired for suppression, their use for checking does not represent an additional cost. It is not necessary, therefore, to charge their wages and equipment against detection. With air patrol, some of the suppression force may be used to man towers. If this is done, the cost per tower will drop materially when air patrol is added to a tower system. It will then be cheaper to use a combination of towers and air patrol than to use either one alone.

A county with few fires needs only a small suppression force. To get the desired detection coverage, it must hire additional personnel. Because there are few fires and the risk from leaving a tower for a period is small, such a county should man its towers at all times with patrolmen and suppression personnel. Tower costs will then be at a minimum when only towers are used and cannot be decreased by using air patrol. The cheapest detection in such a county is to use towers alone.

What Percent of the Fires Should a Unit Try to Detect?

The administrative decision which has the greatest effect on total detection cost in an area is the percent of the fires set as the goal of the detection organization. We have suggested 94 percent as the feasible maximum because the other six percent start at night or on Class 1 and 2 days. This does not mean that 94 percent is a practical goal to work toward. Figures 2 and 3 show that as detection coverage is increased with either towers or air patrol the cost rises more than proportionately. Table 5 shows total cost estimates for various percent detection coverages in a 1,000 square mile area with the best tower and air patrol combination. Total cost rises rapidly as the detection percentage is pushed upward. The important figures in

TABLE 5.—TOTAL AND MARGINAL COSTS FOR VARIOUS DETECTION COVERAGES WITH COMBINED TOWERS AND AIR PATROL

Percent of fires to be seen	Total cost	Marginal cost	Marginal cost per 1% increase
75	$3,136		
80	3,336	$ 200	$ 40
85	3,926	590	118
90	4,966	1,040	208
92	5,616	650	325
94	7,940	2,324	1,162

Table 5 are the marginal costs in the last column which show the cost of raising detection coverage by one percent. The percent of the fires seen can be increased from 75 to 76 by an expenditure of only $40. But it would cost $1,162 to raise the coverage from 92 to 93 percent. Somewhere along the line the administrator must make a decision that the cost of further increases in detection coverage cannot be justified by the resulting saving in damage. This decision will be affected by the number of fires in the particular area. For example, in a county with 200 fires per season it would cost $20.80 per fire to increase detection coverage from 85 to 90 percent. By contrast, in a country with 20 fires per season the cost of making the same percentage increase in detection would be $208 per fire.

Unfortunately, little information is available on the benefits to be obtained by increasing detection coverage. If the coverage is expanded into successive periods of lower fire frequency, as in the example given here, the marginal benefit will decrease with each additional one percent coverage. This is because fire severity and rate of spread also decrease as the rate of occurrence decreases. In theory, detection coverage should be increased to the point where marginal cost just equals marginal benefit. Much research in fire economics must be done, however, before it will be possible to determine this point in practice. Meanwhile, the administrator must make the best judgment he can with the understanding that marginal costs rise and marginal benefits fall as detection coverage is increased.

William B. Berry (1916-1955)

William B. Berry, 39, of Placerville, Calif. died August 1 of injuries suffered when a fork lift he was operating rolled down an embankment. When the accident occurred he was clearing timber from the Silver Fork School ground, 30 miles east of Placerville.

A forestry graduate of the University of California (1937), Mr. Berry was a partner in a consulting forestry firm known as California Foresteering. He was a leader in the forestry profession throughout the California pine region and the Northern California Section of the Society of American Foresters. He was a driving spirit in the El Dorado-Amador Forestry Forum, an S.A.F. Chapter; and was one of the founders of the Sierra-Cascade Logging Conference.

His father, State Senator Swift Berry, was a graduate of the Biltmore Forestry School and his brother, Jack, has a timber brokerage business in Sacramento.

Some Characteristics of Forest Floors From a Variety of Forest Types in California

Joseph Kittredge
Professor, School of Forestry,
University of California, Berkeley

THE ADVANTAGES or disadvantages of the layer of organic material on the surface of the soil are sufficiently important in silviculture and fire suppression as well as in watershed management, that quantitative information about the forest floor may be useful in several ways. The following data on the influences of different kinds of forest may therefore have some value beyond the project in which they were obtained for use in relation to evaporation, surface runoff, infiltration, or erosion.

Organic material above the mineral soil was sampled by cutting around areas of one square foot, measuring depth on all four sides, and collecting the organic matter. The separation of organic and mineral matter was quite easy in these types and later separation in the laboratory seemed unnecessary. The 8 to 70 sampling points in each type were located systematically in the earlier and randomly in the later years. Trends with age were not evident in the stands over 30 years old, where sampling was repeated in the years from 1940 to 1953 so that data of different years were combined as bases for the averages. Dry weights were determined by drying subsamples for 24 hours in an oven at 100° C. Volume weight was computed as the ratio of dry weight to the weight of an equal volume of water. Field moisture capacity was determined as the moisture retained after immersion in water for 72 hours followed by draining over dry mineral soil for 48 hours in cylinders with cheesecloth separating organic material and mineral soil. Cylinders were sealed at the top to prevent evaporation. Field moisture capacity is expressed as a percentage of dry weight.

The plantations of Table 1 and also the coast live oak and grass of Table 2 were located on 30 to 40 percent slopes with clay loam soils at Berkeley. The stands of Table 2, excepting the live oak and grass, represent typical types of the west slope of the Sierra Nevada and two plantations of Coulter and Knobcone pine from the chaparral region of southern California, all on gentle slopes with sandy loam soils derived from igneous rocks.

Data for six of the plantations in Table 1, when they were 30 years old, were reported in 1940 (*5*). The dry weights correspond closely to those found 10 to 15 years later except for Canary pine which increased from 12.6 to 22.2 metric tons per acre. The forest floors and upper mineral horizons of the mature ponderosa and sugar-ponderosa pine types were characterized earlier as to depth, structure, pH, and loss on ignition of the L, F and H layers (*2*). Depths of the A horizon in 1938 were 3.1 inches for the ponderosa pine and 1.5 inches for sugar-ponderosa pine compared with 1.3 and 1.2 inches found in this study. The volatile matter of the forest floor of 150-year-old ponderosa pine on the Sierra National Forest amounted to 19.2 metric tons per acre at 4,000 feet, 51.1 at 5,000, 35.3 at 6,000, and 50.0 at 7,300 feet elevation (*4*). The total floor at 5,000 feet including non-volatile matter was 76.1 metric tons per acre. The sugar-ponderosa pine-fir 50 years old at 5,000 feet had 58.5 metric tons per acre and even old lodgepole pine at 9,800 feet had 44.8 metric tons per acre, volatile matter. These samples were collected 6 feet from the stems and were therefore doubtless under the crowns. However, the amounts are larger than those to be reported presently. Dry weight of 27.6 metric tons per acre from the pine-fir

TABLE 1.—FOREST FLOOR OF PLANTATIONS 30 TO 43 YEARS OLD AT BERKELEY, CALIF.

	Monterey pine	Canary pine	Deodar cedar	Blue gum	Maritime pine	Madrone	Redwood	Christmas berry
Median dry weight, metric tons per acre	25.0	22.2	17.6	15.0	13.8	11.9	10.6	5.1
Median depth, inches	3.1	4.5	2.8	1.6	2.6	2.3	2.0	1.0
Median volume weight	0.06	0.05	0.08	0.06	0.05	0.07	0.07	0.06

TABLE 2.—AVERAGE OVEN-DRY WEIGHT PER ACRE, DEPTH AND FIELD MOISTURE CAPACITY OF FOREST FLOOR IN DIFFERENT FOREST TYPES

Forest type	Dry weight			Depth			Field moisture capacity
	Stand	Under crowns	In openings	Stand	Under crowns	In openings	
	Metric tons per acre			*Inches*			*Percent*
Immature white fir, near Pinecrest, 5,200 feet	27.7	30.2	5.4	1.4	1.5	0.1	161
Mature red fir, near Pinecrest, 6,260 feet	22.2	23.5	17.2	1.3	1.4	0.9	179
Mature white fir, near Pinecrest, 5,200 feet	20.9	20.9	21.1	1.3	1.3	1.3	183
Bigtree, over 1,000 years old, Sequoia Nat. Park, 6,500 feet	.....	26.1	.....	.....	.....	.....	.....
Mature ponderosa pine, near Pinecrest, 5,200 feet	19.4	25.8	15.1	1.3	1.7	1.0	173
Mature sugar-ponderosa pine, near Pinecrest, 5,580 feet	18.3	33.5	8.1	1.2	2.0	0.5	169
Mature coast live oak, Berkeley, 700 feet	11.1	.....	.....	2.1	....	....	159[1]
Knobcone pine, 15-20 years old, San Dimas Expt. For., 2,850 feet	9.9	.....	.....	1.7	....	....	206
Coulter pine, 20-25 years old, San Dimas Expt. For., 2,850 feet	8.5	.....	.....	1.3	....	....	202
Ponderosa pine, 14 feet high, near Pinecrest, 5,200 feet	8.1	7.4	10.6	0.7	0.6	0.9	176
Grass, Berkeley, 800 feet	1.7	.....	.....	1.0	....	....	245[1]

[1]Determinations by an approximate method.

type was reported on the Stanislaus National Forest near the present study area and 27.8 from pine-fir-cedar near Placerville (*7*). Ponderosa pine on the Lassen National Forest at 6,000 feet had forest floor of 11 and white fir, 21 metric tons per acre. Mature Douglas-fir near Wind River, Washington had 29 metric tons per acre of forest floor (*3*). Bigcone Douglas-fir at 4,700 feet on the San Dimas Experimental Forest had 10.1 metric tons per acre of floor with field moisture capacity of 167 percent (*6*).

The plantations of Table 1 were of the same age with the exception of the blue gum which was 5 years older. They grew on the same Los Osos clay loam although the Canary pine and blue gum (*Eucalyptus globulus*) were on the south exposure in grassland and the other species on the north exposure characterized by coast live oak, California laurel, hazelnut, and coffeeberry. The differences in forest floor are therefore attributable to the differences in species. Monterey and Canary pine are the two that deposit the deepest and heaviest layers of forest floor, more than 3 inches deep and over 22 metric tons per acre. Redwood had only 2 inches of floor with dry weight of 10.6 metric tons per acre. Christmas berry, hardly more than a shrub, was the lowest with 1.0 inch of floor. Blue gum with 15 metric tons per acre, 1.6 inches in depth, had a much heavier floor than was apparent from casual observation of what looked like a sparse layer of litter.

Average volume weights varied only between 0.05 and 0.08, the former in the Canary pine and madrone of which the large needles and leaves do not pack closely and the latter in the blue gum and deodar cedar. Blue gum floor has a large proportion of twigs, bark and capsules that add to its density and deodar needles form quite a dense mat.

Field moisture capacities were determined for only three of these types, namely Douglas-fir, 150 percent, Canary pine, 182 and Monterey pine, 186 percent. The retention storage depths (the product of field moisture capacity/100 $\times$ volume weight $\times$ depth of floor) for these two pines are 0.41 and 0.35 inch respectively, an appreciable retention of rainwater most of it subject to loss by evaporation.

The dry weight of forest floor (W) is obviously related to its depth (D) and for Monterey pine, the relation can be expressed as $W = 6.6\,D + 3.5$. The regression coefficient is highly significant and can be interpreted by the statement that dry weight increases 6.6 metric tons per acre as depth increases 1 inch. However, estimates of dry weight by this equation would be only approximations. For redwood with only 17 samples, the regression, $W = 1.9\,D + 7.6$, was not significant. However, the comparison with the equation for Monterey pine suggests that there may be wide differences between species in the relations of dry weight and depth.

The 20-year-old plantations of Coulter and Knobcone pine in southern California in Table 2 have 8.5 and 9.9 metric tons per acre of floor, somewhat smaller than the coniferous plantations at Berkeley. The difference however may be one of age rather than of species. The dense natural stand of ponderosa pine 14 feet high and 28 years old on the Stanislaus National Forest had 8.1 metric tons per acre of floor only 0.7 inch in depth, doubtless a reflection of the slow growth and small size of the trees. Only the grass with 1.7 metric tons per acre had lower dry weight but the grass litter decomposes almost as fast as it accumulates. The stand of coast live oak had the greatest depth of floor, 2.1 inches, but only 11.1 metric tons per acre dry weight, an example of litter of hard leaves that do not pack closely. The other types of mature timber on the west slope of the Sierra Nevada had surprisingly similar forest floors of depths between 1.2 and 1.4 inches and dry weights between 18.3 and 27.7 metric tons per acre. The largest amount in the immature white fir was probably attributable to the denser stand that was nearer the age of culmination of growth. The relation between dry weight and depth is apparent in the averages for the different types.

The dry weights and depths in Table 2 have been segregated for the Pinecrest samples into two categories, one for samples from under the crowns of the trees, the other for samples in the openings between the crowns. In four out of six of the types, the amounts of floor were greater under the crowns and in the immature white fir, more than 5 times as great as in the openings. Presumably the difference between the two categories should increase with the size of the openings but this tendency appears only in the sugar-ponderosa and mature ponderosa pine types. The higher values in the openings of young ponderosa pine and mature white fir are doubtless related to locations of samples close to the edges of the crowns.

The field moisture capacities or retention storage in percent of dry weight varied for the Sierra types only from 161 in the immature white fir to 183 in the mature white fir. The Knobcone and Coulter pine with 206 and 202 percent were somewhat higher but still within the usual range for such data. The grass litter with 245 percent is much the highest as is usually the case in comparison with woody vegetation. However, the volume weight for grass is low, between 0.02 and 0.03, and consequently the depth of retention storage is relatively low. For example, 245/100 $\times$ 0.02 $\times$ 1.0 equals 0.05 inch depth of water, far below the 0.4 inch derived previously for the pines.

Almost all of the foregoing figures are quite similar in magnitude to those that have been reported previously and all for averages of stands are well above the 0.5 inch depth of floor of Monterey pine that has been suggested as a minimum to prevent accelerated erosion (*8*). The danger of erosion would not be a problem in stands of these densities and ages, unless they were considerably reduced in density by cutting. By moderate

cuttings, it should be possible to reduce the losses of water by evaporation from the forest floor without accelerating erosion. The cuttings would result in smaller depths of forest floor and consequently in reduced retention storage subject to evaporation. The same result might be obtained by controlled burning under conditions when only the upper layer of the floor would be consumed. Such silvicultural treatments would be advantageous in watershed management where larger yields of water are important.

Summary

The findings may be summarized in a few statements.

All of these plantations and stands had ample forest floor to prevent accelerated erosion. Monterey and Canary pine produced as much or more in 40 years than was found in mature fir and pine forests of the Sierra Nevada.

Volume weights of forest floor in the different forest types varied only between 0.05 and 0.08.

Field moisture capacities were all between 150 and 206 percent excepting grass with 245 percent. Retention storage of Monterey and Canary pine was about 0.4 inch.

Losses of water by evaporation from the forest floor could be reduced and yields of water increased by thinnings and partial cuttings which would reduce amounts of forest floor but not sufficiently to cause accelerated erosion.

Literature Cited

1. BODMAN, G. B. 1935. The forest floor developed under conditions of summer rainfall deficiency in a California pine and fir forest. Am. Soil Surv. Assoc. Bull. 16:97-101.
2. ———— and J. KITTREDGE, JR. 1938. Description of forest floors from several important forest types of the Sierra Nevada basalt plateau and coast ranges in northern California. Proc. Soil Sci. Soc. Amer. 2:509-21.
3. ISAAC, L. A. and H. G. HOPKINS. 1937. The forest soil of the Douglas-fir region and the change wrought upon it by logging and slash burning. Ecology 18(2):264-80.
4. JENNY H., S. P. GESSEL and F. T. BINGHAM. 1949. Comparative study of decomposition rates of organic matter in temperate and tropical regions. Soil Science 68(6):419-32.
5. KITTREDGE, J., JR. 1939. The forest floor of the chaparral in San Gabriel mountains, California. Jour. Agric. Res. 58(7):521-35.
6. ————. 1940. A comparison of forest floors from plantations of the same age and environment. Jour. Forestry 38:729-32.
7. LOWDERMILK, W. C. 1930. Influence of forest litter on run-off percolation and erosion. Jour. Forestry 28:474-91.
8. ROWE, P. B. 1955. Effects of the forest floor in disposition of rainfall in pine stands. Jour. Forestry 53: 342-48.

IMPORTANT NOTICE TO SUBSCRIBERS

If you are going to move, it is necessary that the proper notification be made, at the earliest possible moment by letter, post card, or post office form No. 22S, giving the old address, as well as the new, with postal-zone number if any. You should also notify your local post office on postal form No. 22 of your change of address. Both postal forms are obtainable at any post office.

As considerable time is required to process a change of address, you are urged to advise the JOURNAL as soon as you know your new address, preferably four weeks in advance of moving.

JOURNAL OF FORESTRY
Mills Building, Washington 6, D. C.

See pages 679-683 for program, Annual Meeting, October 16-19, Oregon

Development of Second-Growth Longleaf Pine in South Mississippi

Lloyd F. Smith
Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, New Orleans, Louisiana

How fast does longleaf pine grow? Observations on some of the oldest longleaf plots in existence show that second-growth stands can produce a cord of wood per acre annually.

MANAGEMENT of young longleaf pine (*Pinus palustris* Mill.) forests is handicapped by an almost complete absence of records on their probable development and productivity. This article presents such records for seven longleaf plots in southern Mississippi. The trees, now about 42 years old.[1] have been under observation for periods of 24 and 29 years.

History of Plots

The plots are in natural even-aged longleaf stands on the McNeill Experimental Forest in Pearl River County, Mississippi. The soil is a deep, well-drained, fine sandy loam. The site index is about 80 feet at 50 years. The stands were unmanaged and exposed to frequent wild fires before the plots were established.

Four plots, each one-fourth acre in size, were installed in 1923, were burned on various schedules for 10 years, and since 1933 have been remeasured periodically for a study of growth and yield. Three half-acre plots were established in 1928 as part of a fire and grazing study.

Despite some mortality at an early age, and the different early experimental treatments, the development of these seven plots is believed to be fairly representative of many natural stands in the region. Fire damage in 1946, an ice storm in 1949, and attack by the turpentine beetle (*Dendroctonus terebrans* Oliv.) following thinnings in 1948 appeared to retard growth somewhat.

Growth

Diameter.—Average d.b.h. of the merchantable stand (trees larger than 3.5 inches in d.b.h.) increased from 4.2 inches at 13 years to 7.4 at 37 years. At age 42, the average diameter was 8.8 inches (Table 1).

The dominant and codominant pines averaged 3 inches or more in diameter growth between 13 and 23 years of age (Table 2). They declined to 1.8 inches per decade between ages 28 and 37, and dropped further to 1.4 inches per decade after their thirty-seventh year.

Basal area.—At age 13, these stands had an average basal area of 13 square feet per acre. By age 37, the merchantable stand had a basal area of 116 square feet.

Cordwood. — Cordwood yield probably is the best practical measure of growth in young stands. At 37 years of age, the study plots had an average volume of 38.6 cords per acre.

Periodic annual cordwood growth reached its maximum—2 cords per acre—between ages 28 to 37. Though cutting, fire, ice damage, and bark beetles caused a substantial drop after age 37, growth up to this time was very good. Total production, including wood removed in thinnings, was 43.8 cords in 42 years.

Saw timber.—Periodic annual saw-timber increment between ages 37 and 42 averaged 526 board feet (Int. ¼-inch rule) per acre. Average volumes per acre were as follows:

TABLE 1.—LONGLEAF PINE STAND AND STOCK TABLE PER ACRE, AGES 13 THROUGH 42

Age (years)	Date	Trees of all sizes	Stand larger than 3.5 inches in d.b.h.			
			Trees	Average d.b.h.	Basal area	Volume
		Number	*Number*	*Inches*	*Sq. ft.*	*Cords*
13	1923	838	133	4.2	13.1	1.2
18	1928	644	251	4.9	33.3	4.4
23	1933	622	346	5.7	61.0	11.7
28	1938	577	386	6.3	83.5	20.7
37	1947	478	383	7.4	115.6	38.6
42	1952	[1]285	[1]230	8.8	[1]96.7	[1]37.2

Basis: 4 quarter-acre and 3 half-acre plots.
[1]Data for the forty-second year do not include 117 merchantable trees cut in thinnings at age 37-42. These trees had a basal area of 21 square feet and a volume of 6.6 cords.

TABLE 2.—CORDWOOD GROWTH AND MORTALITY PER ACRE OF PINES LARGER THAN 3.5 INCHES IN D.B.H., AND DIAMETER GROWTH OF DOMINANT AND CODOMINANT TREES

Age at end of period (years)	Mean annual basal area growth	Mean annual cordwood growth	Periodic annual net volume growth	Periodic annual mortality	Periodic annual d.b.h. growth of dominant and codominant trees
	Sq. ft.		*Cords*		*Inches*
13	1.0	0.09	—	—	—
18	1.8	.24	0.64	0.02	0.31
23	2.6	.51	1.46	.01	.31
28	3.0	.74	1.80	.03	.22
37	3.1	1.04	1.99	.05	.18
42	[1]2.8	[1]1.04	[1]1.04	.65	.14

Basis: 4 quarter-acre and 3 half-acre plots.
[1]Data for the forty-second year include 117 trees cut in thinnings in the 37-42 year period. These trees had a basal area of 21 square feet and a volume of 6.6 cords.

[1]The exact age is not known. It is customary to determine age of longleaf by counting the rings of dominant trees at stump height and then adding 5 years.

	Bd. ft.
Volume at age 37	9,046
Cut between ages 37 to 42	671
Remaining for growth	8,375
Volume at age 42	11,006
Growth, ages 37 to 42	2,631
Annual growth, ages 37 to 42	526

Mortality during these 5 years averaged 111 board feet per acre annually. Since most of it was salvaged, it has been counted as growth.

Thinnings

These stands were thinned at ages 38 and 41. They should have been thinned at about 25 years of age. This is apparent from the sudden drop in periodic annual d.b.h. growth between the twenty-third and twenty-eighth years and by subsequent leveling off of mean annual basal area growth.

It appears from records of the individual plots that thinning at age 25 should have aimed at reducing the stand to about 400 well-spaced crop trees per acre. At that age volume averaged about 15 cords per acre. Under present market conditions, a pulpwood thinning would have removed 100 to 150 pines per acre—a yield of 3 to 5 cords.

After a first treatment at age 25 years, thinnings at 5- to 10-year intervals would be needed to maintain rapid diameter growth of crop trees. This would reduce the rotation age for poles and logs and should result in maximum returns from the stand.

FIG. 1.—Growth per acre in this longleaf pine stand has averaged 44 cords in 42 years.

Natural Pruning

In the absence of early thinnings, natural pruning developed smooth stems that will produce high-grade lumber or poles and piling. At age 13, a stocking of 800-1,000 evenly distributed longleaf trees per acre seems to result in good natural pruning. As these plots also made clear, however, continued crowding greatly reduces diameter growth.

Summary

This article records data on the development of seven plots of natural second-growth longleaf pine in southern Mississippi. The trees are 42 years old, and have been under observation for about 25 years. The site index is 80.

Thinning was delayed until the trees were 38 years old, but the need for it developed much earlier. At about age 25, the stands should have been reduced to about 400 well-spaced trees per acre.

Natural pruning developed smooth stems that will be valuable for poles, piling, and high-quality saw timber.

Cordwood growth up to age 37 averaged more than one cord per acre per year despite some crowding on the better-stocked plots.

Conversion of Weed Hardwoods to Conifers in the Northeast

David B. Cook
Cooxrox Forest, Stephentown Center, New York

Conversion is technically defined as "the transformation of a forest from one type to another favoring a particular species or group of species through such practices as cutting, planting or weeding" (*6*). Implicit therein are the ideas that the change is deliberate and that it is for the better, economically if not ecologically. Most commonly, the effort has been to change from pioneer hardwoods or hardwood coppice to softwoods by clearcutting and planting. Occasionally it has been applied to climax hardwood types. The term does not apply to the unintentional conversion of good woods to poor through fire, disease, grazing or over-cutting. The course of conversion will not necessarily proceed as would natural succession but it probably will be most successful when it parallels that trend. Its aims are primarily economic—to replace one type with another that promises to be more profitable.

Closely akin to conversion is the problem of the natural regeneration of temporary types, notably pure white pine on the more fertile soils. This species can be easily and abundantly reproduced by a two-cut shelterwood but it is extremely difficult to bring the young pines through in the face of fierce competition from seedlings, seedling sprouts, and root suckers of hardwood. Failure to get rid of this advance hardwood reproduction, root and branch, is largely responsible for failure to secure pine following pine.

In the Northeast, there have been many attempts at conversion. At Axton, Dr. Bernard E. Fernow tried to replace virgin beech—birch—maple with white pine, Scotch pine and Norway spruce by clearcutting, brush-burning, and planting. On areas in New England where the chestnut had been killed by the blight, white pine was introduced. There were also plantings of white pine, red pine and Norway spruce on hardwood land cut over for fuelwood. At the Harvard Forest, great efforts were made to bring through a second crop of white pine following the clearcutting of old field stands. Almost without exception, these attempts ended in failure.

To any forester who will read the record carefully, the weaknesses of past attempts at conversion will be apparent. Critically important ecological and physiological aspects of the problem were either ignored or improperly evaluated. There was a tragic lack of appreciation of the vigor with which certain of our hardwoods sprout and sucker. The choice of softwood species for planting was unfortunate, the selection often being on the basis of the *negative virtue of tolerance* rather than on the *positive virtue of rapid juvenile growth*. Season of operation meant nothing; the well educated forester was singularly ignorant of certain simple facts of life that every hill farmer took for granted. Essential cleanings were "too little and too late." Nor were the tools used the best for such work. On the Harvard Forest, "the strong tendency of hardwoods to follow old field pine was not successfully counteracted by any of the reproduction methods employed or by subsequent weedings to favor the pine." (8). Even in the face of three or four cleanings, the planted or naturally reproduced conifers were either suppressed or killed outright by the hardwoods.

Conversion has, in consequence, achieved the reputation of being both hazardous and prohibitively costly. As one eminent forester put it, "You can see the money drip off the machete." There is no denying that conversion is a costly business. Like a war, it is expensive to win—but even more expensive to lose. If each step is not done well and at the correct time, the whole attempt may fail, leaving good land still in the possession of forest weeds or trees of poor form and low quality.

Many foresters contend that conversion, particularly from native hardwoods to exotic conifers, is ecologically unsound. This is not necessarily so. Conversion is not just a whim nor is it always dictated by financial rather than ecological considerations. Much land now in the possession of hardwoods, especially pioneer species, is softwood land from which the conifers have been evicted by man. In the Northeast, many true softwood sites have been taken over by hardwoods following fire. Millions of acres of what was originally mixed forest have had the softwood component removed by repeated cutting; millions more are now occupied by low quality stands of sprout origin. Other millions of acres of abandoned farmland, which once bore coniferous or mixed woods, have reverted to forest weeds (Fig. 1). Many of these acres, especially in the last group, are among our best and most accessible forest lands but many are not quite fertile enough to grow really good hardwood. There are sound reasons for putting such areas back into softwoods. However, conversion should *not* be practiced on lands occupied by hardwoods of even reasonable promise; there are more than enough acres of worthless woods to absorb all our available skill and capital for a long time to come.

My own interest in the problem of conversion arose from necessity. When, in 1929, I acquired the abandoned farm that has since become Cooxrox Forest, the pastures had been out of use for a decade and had reverted either to pure grey birch or to grey birch—aspen—soft maple. (The primeval forest of beech, hard maple and hemlock had been cleared off about 1800.) Such stands had little present or potential value and the succession to longer-lived and economically more desirable species would be both slow and uncertain. Yet, these types occupied a third of my acreage. The choice was to convert or to grow two or three generations of weeds before anything worthwhile filtered in, mean-

while paying taxes and interest. And as long as these pioneers were in occupancy, they would afford a top-grade breeding ground for the gypsy moth (*1*). At best, the grey birch might some day produce a light cut of rough pulpwood or poor firewood, plus a very heavy slash. Sprouting would be vigorous, especially in stands infected with crown gall. Aspen, if salable at all, would make low-value pulpwood; when cut, it would sucker tremendously. Yet, to leave high quality, accessible forest land in the possession of such weeds made no economic sense. The only sound managerial approach was to convert.

Cooxrox Forest is near the southeastern corner of the Grit Plateau, in eastern Rensselaer County, New York. It lies in the transition zone between northern hardwoods and spruce-fir. Grey birch, paper birch, aspen and soft maple are the common pioneers. A combination of fertile but rocky soil, abundant (50 in.) rainfall and valuable tree species, together with adequate transportation facilities and both excellent and varied markets for forest products makes it a superior timber-growing chance. If conversion be biologically and economically feasible anywhere, it should be here.

My first efforts were based on the best technical information then available, most of which proved to be unsound. These early tries were about as wrong as could be; they erred on both species and timing. However, I was able to observe results frequently and make adjustments promptly. Moreover, I had neighbors who were thoroughly familiar with traditional land management techniques. The importance of this became apparent one autumn day when the local patriarch found me cutting birch sprouts in a young spruce plantation and inquired what I might be about. When I had finished explaining the techniques of conversion, he deflated me with, "Don't you know enough to cut brush in the summertime?" The truth was that I didn't, nor did my professional associates.

In the succeeding two decades I have developed a technique whereby even those most persistent of forest weeds—grey birch, aspen, soft maple—can be replaced by valuable softwoods on a sound economic basis. The method is applicable only to areas with good markets for small and low-grade hardwoods; with excellent planting stock available at a right price and with superior growing capacity for the planted conifers. It is expensive. The risks are high. The operation requires capital, persistence and an instinct for gambling. But the returns can be well worth the effort.

FIG. 1.—Seedling grey birch about 35 years old, on abandoned pasture. Within a decade, this stand will disintegrate, to be succeeded by a generation of sprouts. No reproduction of better species has yet appeared. Only under the most favorable economic circumstances would this stand yield any net stumpage. Its potential value is nil.

Conversion, even when most successful, requires 10 years. Before embarking on even a limited program, the landowner must make up his mind about two things. The first is that he will cultivate his planted softwoods and nothing else and get rid of *all* the hardwoods regardless of species or size. The temptation to leave "well-formed stems of desirable species" is strong, but every such tree will make a hole in the softwood canopy and so help defeat the primary objective of the operation. Second, the owner must not grow tired. He must be both mentally and physically prepared to do all that is necessary to beat down the hardwoods, for successful conversion requires that the *whole* of the previous woody plant association be eliminated.

The initial step in conversion is to liquidate the bigger stems in the existing stand in such a way as to reduce their sprouting ability. Where there is a market for peeled hardwood pulpwood, the trees should be chemi-peeled (*4*); while this technique will not entirely abate sprouting, it will greatly weaken it. Summer logging, for whatever product, is next best. Where there is no market for the material, sodium arsenite applied with the Cornell (*5*) tool will be the cheapest way of deadening the overwood. On the other hand, cutting during the dormant season is sure to produce a bumper crop of sprouts and suckers unless the stumps are poisoned with Ammate or some equally effective killer. During falling and skidding, many of the shrubs and small trees will be cut or broken down; such as remain can be deadened with basal hormone spray. But because clear-cut blocks surrounded by uncut high forest act as frost pockets, a hundred or so small (3 in.) stems per acre may be left for insurance against frost damage, especially when converting to larch.

In eastern New York, the tradi-

tional way of clearcutting is to fell the timber in narrow strips, windrowing the tops in the middle and throwing the wood out to either edge. For conversion, this leaves too much of the land covered with slash, too little clear for planting. So some rehandling of the brush will be necessary and is best done as cutting proceeds. Hiley (*7*) has described a system developed in England, called "strolling," where two rows of stakes are set and the brush piled between them. This excellent technique leaves two-thirds of the surface clear and plantable. The stakes must be stout, numerous and well driven, so the method is quite costly, especially when heavy grey birch tops or the dry, stiff branches from chemi-peeled trees are involved. However, it is about the only system that can be used if close spacing (6-x-6-ft. or closer) is planned. A wider spacing, 10 feet between rows by 6 feet in line, gives room for windrowing without staking and at little extra cost. It is necessary only to mark the planting lines so that the brush can be kept out of them; this requires about a tenth as many stakes as does strolling. Such stakes can be of any size and species, as they need last only one year. Careful attention to good alignment will make planting and the first c l e a n i n g easier and cheaper.

Small native conifers (but not white pine where it is apt to be badly weeviled) are usually reserved. *Everything else*, except the frost-protective screen, must be slashed down and piled or deadened with a basal spray. This includes the bigger shrubs, too, for spirea, viburnum, laurel, thornapple, and alder are fierce competitors.

Burning the brush is expensive, unnecessary and not particularly desirable, although it does simplify planting. Hardwood slash cannot be cleanly burned broadcast when freshly cut, and piling is costly. But, if tightly windrowed, it will soon be too sodden and moldy to be a fire hazard. Windrows act as mulch, offer some protection to the planted trees from wind and frost, return nutrients to the soil and afford shelter to the lesser wildlife.

Unlike an old field planting chance, cut-over land has a forest soil, friable and covered with at least a light litter. Frost heaving is reduced and a snow cover retained, so that many well drained sites can be successfully planted the autumn after cutting. Otherwise, the planting must be done the next spring. Delay here is dangerous, for it gives the native flora a headstart that the planted trees can overcome only with great difficulty.

In the past, cut-over areas have been planted with spruce or white pine, on the theory that these relatively tolerant species could best endure competition from the brush and weeds that would inevitably spring up. This is a fundamental error, for no seedling conifer, wild or planted, can compete unaided with the established vegetation. The use of these slow-starting tolerants has been responsible for many past failures.

The need is not for an enduring species that can stay alive under the most disadvantageous conditions but rather for one that can make rapid and vigorous juvenile growth and so take full advantage of our help, to outgrow and suppress the native flora. Red pine can be used successfully, provided good 3-year stock is available and that the site is at least moderately dry and the hardwood stand not too vigorous. But by far the best species for conversion are the larches. Good 2-0 stock will be 12 to 16 inches tall and, if well planted, will grow rapidly from the very start. Both European and Japanese larch require full sunlight, moderate soil moisture, good soil and air drainage. On well watered and fertile soils, they can outgrow any other conifer and most seedling hardwoods, can make a good showing even against hardwood sprouts and suckers. These three species—red pine, European larch, and Japanese larch—are the only ones with which I have been successful, although white pine, white spruce, and Norway spruce have also been tried.

Planting operations will be completed by mid-May of the year following the destruction of the previous stand. This is not the end of the conversion job, as many have supposed, but only a first, short step. The forest floor, now exposed to the warming spring sun and relieved of the drain from tree roots, will put forth new verdure in abundance. Not only will there be sprouts and suckers from cut trees and shrubs, but also a tremendous upsurge of annual and perennial herbs and ferns; these last are tough competitors for newly set seedlings. By mid-June, the Osmunda ferns will have heavy clumps of fronds three feet tall; land infested with hay-scented fern (Dennstedtia) may have a frond cover almost as dense as grass. Bracken (Pteridium) can also be troublesome, although it is not a problem at Stephentown. The space beneath these ferns is shaded, hot and moist, so that the new foliage of coniferous seedlings, especially larch, wilts and molds.

To provide the sunlight, freedom from competition and good ventilation necessary for m a x i m u m growth of the newly planted trees, *all competing growth* must be mowed down close for at least two feet all around each and every one. What actually happens is that we mow a swath four feet wide, with the planted trees in the middle. The timing of this operation is critical, and here is where many early attempts came to grief. If done too early, there will be regrowth the same season; if too late, the new seedlings will suffer from the competition. Because red pine has a short period of height growth—May 1 to July 1 (*3*)—cleaning should begin the first week in June, even at the risk of some regrowth. The larches have a later and much longer season—June 1 to September 1—so cleaning can be deferred until the first week of July. This gives larch two full months of height growth after cleaning and in part accounts for its ability to keep ahead thereafter. At all costs, cleaning must be completed by mid-August. Finding the planted seedlings amid a mass of other foliage, especially larch among ferns, requires a sharp and practiced eye and here is where good alignment

and even spacing pay off handsomely. Failure to do a thorough and timely cleaning may seriously reduce both survival and the first year's growth. For this work, as for subsequent cleanings, I have found a broken-off grass hook to be a most effective tool (*2*). Techniques of broadcast spraying with plant hormones are still unproven, although most promising, at least for red pine.

If the initial cutting and this first-season cleaning have been properly timed and well executed, the effects will last for from three to eight years, depending on the species of conifer planted. Red pine will require assistance sooner than European larch, and that species sooner than the Japanese. A second cleaning will be necessary when the regrowth of hardwoods again offers serious competition. Most of it will be done on woody plants, the planted trees by this time having outgrown the lesser vegetation. If a great number of small stems must be cut, the hook is the best tool. Here again, correct timing is essential. The hardwoods must be hit when they have expended their stored food in putting out new foliage and shoots, and before they can begin to make good the drain. This period lies between June 15 and August 15, depending on species (*3*), after which the stems become lignified and much more difficult to cut. Trees lopped back too early will often sprout again, but deer and frost will kill back many of them. If, however, the remaining stems are 1 inch or more in diameter and relatively few, a better kill can be achieved by basal spraying with 2, 4, 5-T in kerosene; with this technique, season is not so critical, although late summer seems to give more complete root kill and hence less sprouting. At this time, any frost-protective cover should be liquidated.

A third cleaning will be required about the tenth year, to deaden the last few remaining sprouts, usually black cherry, ash, or red oak. This can best be done with basal spray. By this time, well grown larch will be 20 feet tall, red pine 15 feet. Closure will be nearly or quite complete. Any sprout originating under such a stand has little chance of pushing up into the sunlight, so will not long survive. While plant hormones or poisons may be useful in eliminating scattered survivors, the cheapest and most effective method for mass deadening the previous plant association is to close the coniferous canopy tight. The dense shade, heavy needle cast and strong competition for soil moisture will kill out the last vestiges of the former forest and conversion will be completed.

FIG. 2.—Red pine 22 years after planting on cut-over birch land like that shown in Figure 1. Now producing excellent timber, mostly on pruned stems, at the rate of 400 b.f. per acre per year, with a stumpage value of at least $20 per M, International scale. Potential value high.

Operational procedures have changed so much in twenty-odd years and some techniques, such as chemi-peeling and basal spraying are so new that none of the completed conversions at Cooxrox Forest exactly fit the preceding description. However, three examples may be illustrative:

Red pine—An acre of south-facing hillside covered with sprawling clumps of 8 inch grey birch was clearcut in the winter of 1931-32 (wrong season), the brush burned in piles. Planted 6-x-6 feet with 2-2 stock in May 1932. The stock had been severely wind-burned in the nursery the previous winter, resulting in an initial loss of a third. Fails were replanted in the spring of 1933. Plantation cleaned in June-July 1933; March 1936; June 1940. The red pine did well on this warm slope; conversion was substantially complete in 8 years. (Fig. 2).

European larch—Sudeten race. A stand of pure grey birch on two acres of hilltop immediately east off the area shown in Figure 1 was clearcut for charcoal wood in the winter (wrong season) of 1940-41, the brush burned broadcast. Planted in April 1941 with good 2-0 seedlings spaced 6-x-6 feet. Cleaned in the summers of 1941, 1946 and 1952. The last time, scattered seedling sprouts of red oak and white ash, previously reserved, were girdled. Conversion was complete after 12 seasons (Fig. 3).

Japanese larch—In 1941, two acres of steep, east-facing slope were in 25-year old grey birch with a scattering of black cherry and aspen. It was cleancut during the spring and summer, the brush burned broadcast. Planted 6-x-6-feet in April 1942 with extra-good 2-0 seedlings, followed by a first cleaning in August. This combination of summer cutting and summer cleaning so effectively abated the hardwoods that a second cleaning was not needed until the summer of 1950. Although this plantation was damaged by the Great Wind of 1950, the remaining hardwoods will present no great problem of control.

FIG. 3.—European larch 13 years after planting. Excellent survival and proper cleaning have eliminated the former birch woods. This stand, just coming into volume production, will grow 1½ cords per acre per year of pulpwood, worth $6 per cord stumpage; poles, piling or saw timber will bring an even better price. Potential value very high.

Costs

Because of the inflation of the past decade, historical dollar costs are misleading. However, some indication of the economics of conversion can be had from recorded man-hour expenditures. Laying out and staking the 10-foot spaced planting lines requires 2 man-hours per acre. Planting on cut-over land is hampered by roots, aided by mellow soil; the rate runs from 60 to 100 trees per man-hour. Costs for the 6-x-10 foot spacing will be 60 percent of those for 6-x-6, about the same as for 8-x-8. The initial cleaning requires the close mowing of everything on half the area and the knocking down of the more vigorous stems—except for the frost screen—on the remainder; it will take 8 to 12 man-hours. When a 6-x-6-foot spacing was used, the first cleaning covered substantially the whole area, took 18—20 man-hours. The basal spraying of an hundred trees 1 to 4 inches in diameter will require 1 man-hour of labor and 2 gallons of solution, the latter at 80¢ per gallon. The number of stems that survive two summer cuttings, deer browsing, and frost will be extremely variable. The third cleaning, at ten years, will usually involve more walking than working; often, it can be combined with the first stage of pruning.

By the time conversion is completed, the landowner will have invested in his planted softwoods more than twice the amount usually required for planting an acre of old field at the same spacing. Because of this higher capital requirement, only the best sites should be selected for conversion at this time. Certainly, it will be sound economics to plant the open land first, not only because it can be done at lower cost but also to forestall invasion by brush.

Conclusion

Conversion is a legitimate technique of forest management. It need not be uneconomically costly and, if the operation be well planned and properly executed, the results can be entirely satisfactory. It entails a certain amount of risk, but so does every other silvicultural operation. In thinking about conversion, I am reminded of Robin Hood's admonition to the men of Sherwood Forest as they sallied forth to rescue Will Stutley from the Sheriff: "I would that ye shed no blood, but if ye do strike, strike hard, and see that there is no need to strike again." It would be equally good advice to those who might contemplate conversion. Either stay out of it, or go in with intent to complete the job and to rescue from forest weeds some of the best located and most productive of our Northeastern forest land.

Literature Cited

1. BESS, H. A., S. H. SPURR, and E. W. LITTLEFIELD. 1947. Forest site conditions and the gypsy moth. Harvard Forest Bulletin No. 22.
2. COOK, DAVID B. 1940. A useful forest tool. Jour. Forestry 38:63.
3. ———. 1941. The period of growth in some Northeastern trees. Jour. Forestry 39:956-959.
4. ——— and LAWRENCE S. HAMILTON. 1953. Chemi-peeling pulpwood in New York. Jour. Forestry 51:566-569.
5. COPE, J. A., and J. N. SPAETH. 1931. The killing of trees and sodium arsenite. Jour. Forestry 29:775-783.
6. HAWLEY, R. C. et al. 1950. Forest terminology. Soc. American Foresters. Washington.
7. HILEY, W. E. 1936. The stroll method and the lane method of planting. Quarterly Journ. Forestry (April).
8. LUTZ, H. J., and A. C. CLINE. 1947. Results of the first thirty years of experimentation in silviculture in the Harvard Forest, 1908-1938. Harvard Forest Bulletin No. 23.

Forest Types and Conditions in Cuba[1]

Earl E. Smith
Foreign Operations Administration,
Lima, Peru

CUBA has a total land area of about 44,000 square miles. Over half of this is arable. Forests are thought to have originally covered more than 60 percent of the island but their area is now limited to approximately 15 percent.[2] This reduction was brought about primarily as a result of widespread land clearing for sugar cane. Large land holdings in the regions of arable soils are currently resulting in increased population pressure in the mountainous areas and the clearing of marginal lands for farming.

The classification of approximately 5,000,000 acres as forest land in Cuba gives a false impression of this resource. Most stands have been exploited to the extent that they consist of low-valued species, while the scattered nature of the desirable species, mixed in with valueless trees, usually results in high-grading. Such stands may be called forests, but they are incapable under present utilization methods of producing a supply of commercially valuable timber.

Forest Regions

Cuba's remaining forests (Fig. 1) are divisible into three main regions: (1) the Sierra Maestra Mountains in western Oriente Province; (2) the highlands of eastern Oriente Province; and (3) parts of Pinar del Rio, the westernmost province. Scattered stands still exist on the Isle of Pines, Zapata Peninsula, and the Trinidad Mountains in southern Las Villas Province, and parts of Camagüey Province. Two areas of old-growth forests remain: one in the highlands of eastern Oriente, and the other in the 3,000- to 5,000-foot zone in the Sierra Maestra Mountains.

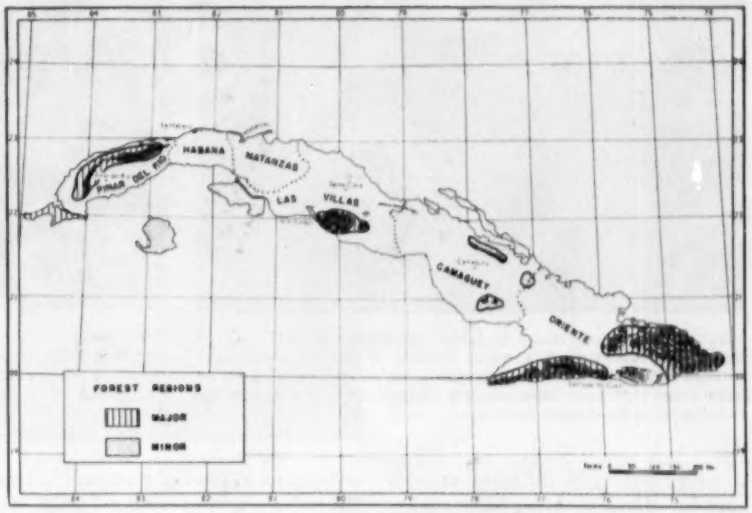


FIG. 1.—Forest regions of Cuba.

Forest Types

In classifying Cuba's forests the primary division was made on a floristic basis between the pines and the broadleaf species. The second division is based on edaphic factors, with the geographic counterparts indicated under the same heading. The divisions of the third order are based on the amount of water available for use by the trees as reflected in the character of the vegetation. The availability of the precipitation water is controlled by a variety of factors including the amount of rainfall, nature of the substrata, evaporation rate, topography and exposure, and mountain rain shadows.

Pine types.—The pinelands, which involve about 4 percent of Cuba's area, have nearly all been cut over. Pines larger than 10 inches in diameter are rare except in the Sierra Maestra Mountains, which contain the only pine reserves on the Island. Pine was not found on limestone-derived soil, but on other types of soil where the site is adverse it replaces the broadleaf species.

Pine (*Pinus occidentalis* Sw.) occurs in the Sierra Maestra Mountains as scattered stands on physiologically dry sites, (Fig. 2) and on areas of landslides and amphitheater-like ravine heads where there is a seed source nearby. The pine of eastern Cuba (*Pinus cubensis* Griseb.) is found on deep lateritic soils derived from igneous serpentine rock (Fig. 3). Where the depth of these soils is not great, and where the water table is apparently high, broadleaf species replace the pines. In Pinar del Rio, pino macho (*Pinus caribaea* Morelet) is found in pure stands on a similar lateritic deposit (Fig. 4), but on the nearby shales and sandstones of the extensive San Cayetano formation pino macho is found as a minor component of stands which are dominated by pino hembra (*Pinus tropicalis* Morelet) (Fig. 5).

Available data suggests that approximately 60 percent of Cuba was covered with forests in pre-Columbian time. This forest was largely broadleaf with pinelands probably occupying the same area as they do today. Apparently the basic distribution is controlled by the inability of certain habitats to retain enough moisture to support dense stands of hardwoods, and this permits the intolerant pines to compete and become established.

Broadleaf types.—The broadleaf stands containing various combina-

[1]Publication No. 14, Journal Series, from the Atkins Garden and Research Laboratory of Harvard University, Cienfuegos, Cuba. This article is based on a study of the Cuban forests which was sponsored jointly by three units of Harvard University; the Maria Moors Cabot Foundation, the Atkins Garden and Research Laboratory, and the Harvard Forest. The complete study, *The Forests of Cuba*, has been published as a bulletin of the Cabot Foundation, 1954.

FIG. 2.—Old-growth stand at 3,300 feet elevation in the Sierra Maestra Mountains of western Oriente Province. The pine (*Pinus occidentalis*) occurs on physiologically dry sites or on bare areas that have been created by landslides and are in the vicinity of a pine seed source.

FIG. 3.—The endemic pine (*Pinus cubensis*) of eastern Oriente Province is found on deposits of lateritic soil, the iron content of which often reaches 50 percent. The pines reached an average height of 70 feet and ranged from 6 inches to 18 inches in diameter. Although there were many seedlings under the bracken fern there were no intermediate-sized trees.

tions of over 200 different species can be divided into four major types: (1) those found on soils derived from noncalcareous rocks, (2) those found on limestone formations, (3) those on fertile clay soils and alluvial lowlands, and (4) those in saline swamps.

The forests found on soils derived from rocks of igneous, metamorphic, and sedimentary origin (excepting limestone) are mostly in the mountainous regions. Here a distinctive difference is exhibited between the upper slopes and ridgetops which support on their drier soils a *monte bravo* type forest, and the lower slopes and valleys with their deeper, wetter soils which support a *monte fresco* type (Figs. 6 and 7). The drier areas or *monte bravo* type would be comparable to the oak-hickory stands of the Appalachian Region of eastern United States while the wetter areas or *monte fresco* type more nearly approaches the cove hardwood type of the same region. The *monte bravo* areas produce slow-grown durable timber which is so necessary in a tropical country. The *monte fresco* areas support faster-grown species usually with a few valuable furniture woods and a large number of soft white woods that have little economic value at present.

Most of the existing forests found on limestone formations are on the rough coastal areas. These stands are of a *monte bravo* type due either to a low annual rainfall or to the rapid removal of the precipitation because of cracked and porous substrata. From these sites come some of the slow-grown, fine-grained hardwoods such as mahogany (*Swietenia mahagoni* [L.] Jacq.), and the legume sabicú (*Lysiloma latisiliqua* [L.] Benth.) for which Cuba is famous. Because of past exploitation and continued shortages of the better timbers in Cuba these two species and the valuable Spanish cedar (*Cedrela mexicana* M. J. Roem) have been restricted from export since 1946.

Forests of the upland limestone areas and the fertile clay soils have been extensively cleared and are now restricted to a few residual stands, usually along streams and on steep slopes or rough surfaces.

Coastal areas which are gently sloping and have shallow waters off-shore support extensive mangrove stands, but where the coastline is steep and rocky a semi-xerophytic scrub growth appears.

TABLE 1.—AN OUTLINE OF THE FOREST TYPES OF CUBA

A. PINE FORESTS
1. Pine in pure or mixed stands in small areas found in the Sierra Maestra Mountains of western Oriente Province.
2. Pine forests on lateritic soils derived from igneous serpentine rocks found in eastern Oriente Province, and in the small area called Cajálbana in Pinar del Rio Province.
3. Pine forests on shales and interbedded sandstones, and sandy areas found in Pinar del Rio and the northern part of the Isle of Pines.

B. BROADLEAF FORESTS
1. Forests on soils derived from rocks of igneous, metamorphic, and sedimentary (except limestone) origin in the Sierra Maestra, eastern Oriente, Sierra de Trinidad, and the ravines and alluvial valley floors in the shale and interbedded sandstone areas of Pinar del Rio.
   (1) Scrub
   (2) Monte bravo
   (3) Monte fresco
2. Forests found on soils derived from limestone rock and found in all parts of Cuba.
   (a) Coastal forests on dogtooth limestone or seboruco, found principally on the Peninsula de Guanahacabibes, Isle of Pines, Peninsula de Zapata, Cabo Cruz and Cabo Maisí.
      (1) Scrub
      (2) Monte bravo
   (b) Upland forests on limestone found principally in the Cordillera de los Organos, Sierra del Rosario, and part of the Sierra de Trinidad, and surrounding the igneous masses in Oriente.
      (1) Monte bravo
      (2) Monte fresco
3. Forests on fertile clay soils intermingled with savannas, and those on alluvial lowlands. Both of these are found as small residual stands in most provinces.
4. Mangrove swamps found in suitable localities on all coasts of Cuba.

FIG. 4.—Pure stands of pino macho (*Pinus caribaea*) on the lateritic soils of the Loma de Cajálbana in Pinar del Rio Province. This easily accessible area is continually cut and trees over 10 inches d.b.h. are rare. The lumber from the small logs in the center foreground sells for about $180/M.

FIG. 5.—Pino hembra (*Pinus tropicalis*) dominates the dry rounded ridges of shale and sandstone of the extensive San Cayetano formation in Pinar del Rio Province. In the ravines and larger valleys where there is more moisture and an accumulation of soil, palms and hardwoods occur.

Soils and bedrock apparently exert considerable effect on the distribution of the forest stands of Cuba. This is well illustrated by the absence of pine from limestone and the occurrence of pino hembra and pino macho on the shales and sandstones, but the absence of pino hembra from the neighboring area where pino macho occurs in pure stands.

Land Use

There have been two important factors which have brought about the extensive reduction of Cuba's forest area and the depleted condition of its remnants—land clearing and forest exploitation.

Land clearing.—By the end of the Spanish Rule in 1899 the gradual clearing of land for agricultural use had not seriously reduced the forest area. The present trends in destruction and removal date from the treaty of 1903 between Cuba and the United States. This treaty gave Cuban sugar a place on the preferred list of imports into the United States. Land was rapidly cleared for cane, and the forests ruthlessly cut and burned. This trend reached a peak just after World War I when the price of raw sugar soared from near 8 cents to about 23 cents. The resultant speculation, which has been called "the dance of the millions," caused many acres of marginal land, particularly in the provinces of Camaguëy and Oriente, to be cleared. With the inevitable crash caused by the drop of sugar prices at the end of 1920, many of the marginal fields were abandoned, although the sugar frontier has continued to move eastward until most of the poorer caneland of Oriente has been exploited.

Forest exploitation.—The second factor that is destroying Cuba's forests is the almost complete ex-

FIG. 6.—Old-growth *monte fresco* stand on non-calcareous soil in the Sierra Maestra Mountains. Yamagua (*Guarea guara*) in the center foreground is 20 inches in diameter and the large yaba (*Andira inermis*) behind the guide is 40 inches in diameter. Among the other species are guarano (*Cupania* spp.) and jobo (*Spondias mombin*).

FIG. 7.—*Monte bravo* on non-calcareous soil in eastern Oriente Province. The tree to the left of the photograph is ocuje (*Calophyllum brasiliense* var. *antillanum*).

ploitation for products as the timbered areas shrink. This is climaxed by cutting for charcoal.

Typical steps in harvesting a forest stand are:

1. Removal of the larger and more valuable saw logs.
2. Removal of second-class trees for saw logs.
3. Removal of smaller trees of the best classes for railroad crossties or fence posts.
4. Most of the remaining wood is then used for charcoal or firewood, with the preferred species often being small trees of the same species removed in one of the previous operations.

This complete utilization of the stands is followed in some areas by final clearing and burning for pasture or cultivated crops. Even when left in timber cover, however, the charcoal and firewood stage of exploitation leaves only a depleted stand consisting of inferior species.

Approximately 70 percent of the wood cut in Cuba is used as fuel. Of this total 60 percent is used to produce charcoal; the remainder as fuelwood. Charcoal, the principal fuel for cooking, is produced by old-fashioned and wasteful methods, with by-products and only inferior charcoal. The use of wood for fuel not only has reduced the potential productive capacity of forested areas, but is creating serious erosion problems in the mountainous regions.

Future Wood Supplies

The per capita consumption of wood in Cuba fell from about 100 board feet per person in 1946 to near 60 in 1951. During this same period home production decreased while imports increased, and exports dropped to the point that they are no longer significant. With the depletion of Cuba's forest resources, the island has three possibilities for obtaining a wood supply large enough to support her present economy: (1) rehabilitation of the remaining forests and technological advances in the utilization and preservation of woods not used at present, (2) importation, and (3) plantations.

Importation has been increasing and probably will continue to increase as remaining forests are depleted. With the exhaustation of supplies from Central America, or an economic situation which would not allow her to compete in the world market, Cuba will be without adequate resources. In order to reduce this danger it will probably be necessary to establish plantations of rapidly growing exotic species, especially for crossties, fence posts, and fuel, because the native species will not grow fast enough to be of help during the transition period.

The rehabilitation of the natural stands will be the hardest problem to solve because of the use of wood for fuel, which takes about three-quarters of the annual production and at the same time is one of the major factors in destroying the growing stock. Other stands that appear to be well stocked have been high-graded to such an extent that it will be years before they can be brought back into commercial production. The small patches of land in the mountainous regions that can support small farms probably will continue to be cleared and the existing *montes frescos* removed.

A Program for Rehabilitation

On the basis of this study it is recommended that the pine lands be brought under management, at least with fire protection and some planting where the seed trees have been destroyed. This will provide substantial quantities of construction timbers if managed on a sustained-yield basis. Because the soils are poor they will not be subject to clearing for farm lands. With plantations to yield crossties, fence posts, and wood for fuel, the drain on the lower diameter classes in the existing forests could be reduced, and it will then be possible for these forests to recover from the intensive utilization of the past. Such plantations should first be established in conjunction with the sugar centrals where the greatest need exists at present and where a continuity of management can be expected.

The silvicultural management of the natural forests should be directed toward the careful harvesting of existing stands in order to prevent them from being destroyed. It is imperative that sufficient regeneration of suitable species be present so that the forests will continue to produce timber. Many of the problems concerned in the management of the natural stands are of a long-term nature, but they are of the greatest importance to the attainment of the largest returns from land which will probably always remain in forest. By gradually bringing the non-arable forested lands of the Island under some form of sustained wood production the forests will be able partially to support this important phase of the Cuban economy.

Summary

The existing forests of Cuba are limited to the rough coastal deposits and mountainous areas due to extensive land clearing in the past. Continued destructive utilization of these remaining forests is reducing not only the forest area, but the potential productive capacity.

An outline of the forest types of Cuba is presented.

On the basis of this study the following recommendations are made:

1. The few remaining old-growth stands be harvested in such a manner to insure future forest production.
2. The cut-over pine stands and the high-graded broadleaf stands on non-arable soil be brought under management and rehabilitated for continued wood production.
3. That plantations be established in conjunction with the sugar centrals to provide small-diameter stock in the form of crossties, fence posts, and fuel wood.
4. That the use of wood for fuel be studied in an attempt to introduce another type of fuel which will prevent the continued destruction of the forests and the forest soil.

Bibliography

1. CANET, GERARDO A. 1949. Atlas de Cuba. Harvard University Press, Cambridge, Mass.
2. FORS, ALBERTO J. 1952. Forest statistics of Cuba. Personal communication.
3. MARRERO, LEVI. 1951. Geografia de Cuba, 736 pp., Habana.

Importance of Wood Quality in Tree Breeding

Benson H. Paul
Division of Silvicultural Relations,
Forest Products Laboratory,[1]
Forest Service,
U. S. Department of Agriculture

ONE WORTHY OBJECT of tree breeding is to produce trees of rapid growth. If trees can be developed that will reach merchantable sizees in a fraction of the time now required, it will be of great advantage to the timber grower. However there is danger that the wood produced from this rapid growth may be unsuitable for its intended use. The breeding of trees for disease, insect, or drought resistance, or for rapid growth is not enough; the quality of the final wood product must also be considered.

Timber quality, according to Richens (*10*), includes both anatomical and chemical properties of the wood. Only anatomical properties will be discussed in this paper.

Anatomical properties of particular interest are fiber length, the proportions of springwood and summerwood, and figure. Fiber length is of obvious importance to the pulp and paper industry. Proportions of spring and summer wood influence density, and density results in greater mechanical strength and in higher pulp yields on a cubic foot and per acre basis. Shrinkage, warpage, and other characteristics of wood affecting its satisfactory use are related to density and anatomical structure in one way or another. Figure displayed by growth rings in wood is an anatomical feature eagerly sought for special uses. In many cases, therefore, the objectives of tree breeding need to be two- or even threefold. In formulating these objectives, a thorough knowledge of the effect of environment on wood quality is needed.

Softwoods

For coniferous species native to the United States, tests at the Forest Products Laboratory show that rapidly grown trees do not produce the best lumber for most uses, particularly for high-class products. They may, of course, be acceptable for many ordinary uses or for pulp.

Among the faults recognized in rapidly grown coniferous species under natural conditions are low density and strength. Another fault that may accompany these is excessive shrinkage along the grain. Of course for some uses density or high strength are not important. This is true for many uses of white pine. But even in white pine it has been found that when growth rings are as few as 4 to 6 per inch the wood is unsuitable for match stock, one of the important uses of white pine. The reason is that in cutting match sticks from wide-ringed blocks, many of the sticks contain only the weak springwood portion of the growth ring; as a result, they lack the necessary strength for striking. White pine with 12 to 16 rings per inch produced satisfactory match sticks, since in this case some of the stronger summerwood was present in each stick.

Initially fast-grown, wide-ringed wood in young southern yellow pines usually is below average in density. It has short fibers, and the fibers themselves are made up of fibrils that lie at a large angle to the axis of the fiber. This anatomical arrangement in the fiber walls gives rise to unusually high shrinkage of the wood along the grain during drying, which results in warping that makes it unsuitable for many uses. If rapid growth is to be an objective in such species, an effort ought to be made to develop trees in which the fibrils are at a small angle to the axis of the fiber. This may take a long time to accomplish, since evolution of wood characteristics may be expected to take place very slowly. According to Arthur Koehler (*6*), wood is the most conservative part of a tree from an evolutionary standpoint. This is evident in a number of genera, like the oak and pine, in which the wood of a number of species cannot be separated on the basis of its structure, although botanical characteristics of fruit and flowers, upon which species classification is based, may be significantly different.

In our native species widths of growth rings vary with conditions of environment. Variations in growth rate may also result from silvicultural changes that take place naturally or as a result of treatment of a stand. Rings may be wide at first and gradually become narrower as the trees become larger and relative growing space of trees becomes less. Along with this change in ring width, changes have been observed in the size of fibril angles in the southern pines, With initial slow growth of trees, the fibril arrangement becomes stabilized at small angles much nearer the pith, although perhaps no sooner in years than in wider ringed trees. Investigations along this line are in progress.

In breeding trees for maximum diameter growth, the objectionable structure tendencies of the wood need to be overcome. Width of rings also affects appearance of finished lumber, particularly in species with prominent summerwood bands. When considerable areas of summerwood are present on the surface, as in flat-sawed lumber, the lumber does not hold paint as well as when individual summerwood areas are relatively small, as in quarter-sawed lumber. Variations in the springwood-summerwood ratios in growth rings likewise vary with environmental conditions. The total amount of summerwood is influenced by soil moisture during the growing season; the more moisture, the more summerwood. Extremely dry or wet growing seasons give highly contrasting amounts of summerwood. Total springwood seems to be influenced by crown size, and at a given cross section in the tree, by proximity of the green crown when other factors are equal.

[1]Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

In studies of rotary-cut veneer from second-growth Douglas-fir, wide rings resulted in an uneven distribution of springwood and summerwood that gave an unbalanced sheet (*4*). The veneer from wide growth rings did not have the fine texture desirable for faces. Production of Douglas-fir timber yielding high-grade veneer logs appears to be a silvicultural problem calling for growth-rate control and also for pruning to rid the trees of persistent dead branches. For this species, not less than 10 rings per inch is recommended for high-quality face veneer.

Hardwoods

Among broadleaved species, investigations have shown that wood of uniformly high specific gravity resulted from sustained of accelerated growth in tree diameter. Retardation of growth, abrupt or gradual, resulted in a decrease in the specific gravity of the wood (*7*). In other words, the growth-specific gravity pattern was about the opposite of that in conifers. However, this relationship in hardwoods has not been borne out in hybrids of the genus Populus; the rapidly grown, wide-ringed hybrids proved in most cases to be of lower specific gravity than the native species of the genus—quaking aspen, bigtoothed aspen, and eastern cottonwood.

Wood from 18 hybrid clones representing 12 different species crosses averaged only 0.322 in specific gravity in comparison with 0.35 for native *Populus tremuloides* and *P. grandidentata* and 0.37 for *P. deltoides*. Tests of *P. trichocarpa* gave average specific gravity of 0.32, close to the average of the 18 hybrid clones. Only one hybrid clone exceeded the average of aspen in specific gravity, but another clone of the same parentage had wood close to the average of all 18 clones (*2*). In another test, two hybrid trees submitted by the Northeastern Forest Experiment Station averaged only 0.302 and 0.271 in specific gravity.

The question for timber producers and users to decide is whether it is preferable to grow wood of low density on a short rotation or wood of higher density on a much longer rotation. They should consider the fact that strength properties of timber and yields of pulp on a cubic foot basis increase with increasing specific gravity of the wood.

Although high specific gravity values accompany rapid growth in most broadleaved species, rapidly grown material is not always desirable. In species like ash and hickory, wood of rapid growth, although high in density, may be low in stiffness. Pillow has designated as "rubber ash" a rapidly grown wood from moist creek bottoms (*9*).

Natural finishes reveal the ring pattern in lumber and veneer—patterns that are greatly influenced by growth rate. For many uses, wood of moderate to slow growth is preferred over rapidly grown wood.

Old-growth oak or yellow-poplar having a lower specific gravity and hardness than the more rapidly grown second growth of these species is preferred for many uses because it shrinks and warps less, is more workable, and is easier to fabricate.

The direction of grain and presence of figure in wood have been considered from the standpoint of developing strains or hybrids that will have high value because of their attractiveness. H. G. Champion (*3*) in 1927 grew a large percentage of spiral-grained offspring from seeds of spiral-grained trees. As a result, he claimed that spiraling was hereditary. However, because of the variable occurrence of spiral grain among our native species, there is some evidence that spiral grain also develops from other causes. Sometimes spiral grain will occur only late in the life of a tree. In many cases the degree of spiral changes, or it may spiral first in one direction and then in another. In some released ponderosa pine trees, it was observed that the degree of spiral was reduced by acceleration of growth; in one of the trees the spiral reversed its direction. General observations indicate that spiraling is associated with slow growth and becomes intensified if growth is retarded.

Interlocked grain appears more likely to be hereditary than spiral grain. It is usually characteristic of most trees of a species; for example, sweetgum.

In Finland, the Forest Research Institute (*5*) tested hereditary tendencies of figure in birch. Four-year-old trees grown from seeds of parent trees having figured wood were planted in 1929. After 6 years, 44.6 percent had developed figure and, after 9 years, 61.7 percent. It was claimed that figure could be detected in trees as young as 2 years in the nursery beds. It was stated, also, that figure formation slowed down the growth of the birch and that the figured trees developed a bushy habit of branching, requiring pruning for the best results. Stakes were used to hold young figured trees upright, since the winding wood fibers caused the stems to become crooked. In Finland, grafting is practiced to reproduce the best racial features of figured birch.

A few years ago curly aspen in Maryland attracted much interest. According to Schreiner of the Northeastern Forest Experiment Station, the origin was traced to a hybrid, *Populus canescens*, resulting from a cross of European white poplar and European aspen. It was distributed in this country as a shade tree. The wood of this particular clone had interlocking fiber, and it is reported that individual trees were sold at high prices ($700 to $800) for furniture and cabinet use.

Recently among five trees representing a natural hybrid of poplar submitted by the Ames, Iowa, Research Center of the Central States Forest Experiment Station, two trees revealed a very attractive figure in sliced veneer. These trees were not of exceptionally rapid growth, having diameters of 12 and 14 inches at breast height and ages of about 30 and 36 years.

Black walnut is a species in which occasional trees have figure highly valued for veneer. The cause of figure in walnut, like bird's eye in maple, is not clearly understood.

A number of years ago, a highly figured black walnut tree, known as Lamb's walnut (*1*), was propagated by grafting. A specimen thought to have originated from that tree, sent to the Forest Products Laboratory recently, showed no tendency toward a figured grain.

Pillow (*8*), a number of years ago, examined sugar maple for the presence of bird's eye. He discovered a tendency toward the formation of dimples—supposedly the forerunner of bird's eye—in young suppressed advance reproduction. If bird's eye can be recognized in small trees, then they could be marked and favored in making thinnings and the proportion of bird's eye increased in a maple forest.

Wood from only two hybrids from the Institute of Forest Genetics has been tested at the Laboratory; a natural hybrid of Jeffrey and Coulter pines and a hybrid of knobcone and Monterey pine. Both trees were of relatively rapid growth. They were tested for specific gravity and shrinkage. These trees did not show any outstanding wood characteristics in their favor over those of the parent species other than rapid growth. The wood, however, was characterized by abnormally high longitudinal shrinkage, although not equaling high values obtained previously in the wide-ringed wood of several other coniferous species.

Conclusions

Tree breeding should be planned with the final product in mind. It may not be sufficient to accentuate a single phase of development. The apparent advantages in volume growth per tree, when the sole aim of breeding, may be offset by disadvantages in the usefulness of the lumber from it.

The quality of wood resulting from experiments in forest genetics should be tested at the earliest possible opportunity to find out whether new types of wood structure exist and, if so, which ones are most suitable for further development. The selection and propagation of trees that produce figured wood wood of above average value for a species appears promising.

Literature Cited

1. ANONYMOUS. 1927. Walnut men seek figured grain tree. Chicago Journal of Commerce. No. 2.
2. BRAY, MARK W. and BENSON H. 1942. Pulping studies on selected hybrid poplars. Paper Trade Jour. Vol. 115, No. 16, pp. 33-38.
3. CHAMPION, H. G. 1927. An interim report on progress of investigations into origin of twisted fibre in *Pinus longifolia*. Indian Forester 53, pp. 19-22.
4. FLEISCHER, H. O. 1949. The suitability of second-growth Douglas-fir logs for veneer. Jour. Forestry 47: 533-537.
5. HEIKINHEIMO, O. 1940. On odling av masur-björk. (Cultivation of Figured Birch.) Skogen Vol. 27, No. 9, p. 165-167. Illus. (Trans. by George S. Perry.)
6. KOEHLER, ARTHUR. 1939. Heredity vs. environment in improving forest trees. Jour. Forestry 37: 683-687.
7. PAUL, BENSON H. 1930. The application of silviculture in controlling the specific gravity of wood. U. S. Dept. Agric. Tech. Bul. 168.
8. PILLOW, M. Y. 1930. "Bird's eyes" in maple are not due to dormant buds. Hardwood Record, Chicago, Vol. 68, No. 9, pp. 45-46.
9. ————. 1950. Guides for selecting tough ash. South. Lumberman 181(2264):42, 46, 48, 50, 52.
10. RICHENS, R. N. 1945. Forest tree breeding and genetics. Joint Publication No. 8. Imperial Bureau of Plant Breeding and Genetics, Cambridge, Eng. Imperial Forestry Bureau, Oxford, Eng. 79 pp.

T. S. Palmer (1868-1955)

Theodore Sherman Palmer, world famous naturalist, and an Associate Member of the Society of American Foresters for 40 years, died in Washington, D. C. July 23, 1955.

Born in Oakland, Calif. January 26, 1868, Dr. Palmer received an A.B. degree from the University of California in 1888, and the M.D. degree from Georgetown University in 1895.

A nationally known ornithologist, he entered the old Biological Survey (now the U. S. Fish and Wildlife Service) in 1890, rising to the position of assistant chief in 1910. He early became interested in forestry and was responsible for pioneer research in combating rodent pests injuries to tree seedlings.

He was a prolific contributor to scientific journals, and was the author of several books. Many of the early game regulations were drawn up by him, especially those governing the importation of birds and mammals.

A member of numerous scientific societies, he was active in all those having to do with the conservation of renewable natural resources.

The Responsibilities of a State Forest Entomologist[1]

Wm. H. Bennett[2]

THE FORESTS of our country have had, and always will have, insects and diseases capable of periodically destroying tremendous quantities of timber. With our changing techniques and increasing intensity of management, extensive plantings and improved logging equipment the pest situation is certain to be affected. New problems will arise through necessity and progress. Higher timber values augment the importance of insect damage. The role of the entomologist becomes greater as the significance of the insect increases.

Prevention and control of forest insect epidemics are difficult and involved. Before suitable methods can be advanced, the habits of the insects, their life-histories and relationships to the forest and to each other must be understood. Even after effective control methods have been developed, it is necessary to know when and where to start, and when to stop. There is basic and practical research to be done. The field is wide open!

An entomologist fully appreciates what the primary problems are. He must arouse and encourage others to take an active part. He should enlist organizations, institutions, research foundations, and individuals to do their share in solving the many problems. He should provide counsel to those who need help, and assist foresters and forest owners in the planning of local projects.

Outbreaks of forest insects do not arise overnight. Months and sometimes years of favorable conditions may be necessary before the insect population reaches epidemic proportions. It is, therefore, necessary and economical to be constantly on the alert for initial signs and then destroy outbreaks in their incipiency. This requires an almost constant watch by land and air, especially in forests stricken by drought, fires, and storms.

Population increases of some of our insects, such as bark beetles, may best be observed from the air. In relatively inaccessible areas, this is the most practical method by which some insect outbreaks can be located. The entomologist must determine when, where, and how often survey flights are to be made. Different methods must be devised to detect and evaluate damage caused by each kind of insect.

Some insects, especially in their initial stages of attack, may better be observed from the ground. Defoliation by such insects as sawflies, may be relatively inconspicuous from the air until well advanced. From the ground, however, they may be detected by their crawling bodies or by fecal pellets that fall from infested trees. In this respect the entomologist should enlist the aid of cooperators among county agents, tree farmers, and foresters in developing a well organized ground detection and reporting system.

Many forest insects appear regularly each year; or sometimes periodically at intervals of several years. Insects normally insignificant may become locally abundant and destructive due to some minor change in environment. Even in the most carefully managed forests, failure to recognize early symptoms may give rise to serious trouble. The entomologist, through more intimate knowledge of insect behavior, is better able to detect early stages of insect epidemics and to appreciate conditions of high risk. He should, therefore, distribute timely warnings and pertinent information to those concerned. Such information should include recognition of the insects, their significance, when and where to expect them, and what to do to prevent or control them.

The entomologist's task of informing forest owners and forest land managers in how to prevent insect epidemics, and training them in pest identification and control is a large one. The many different insect species, their small size and apparent similarity cause much confusion. It is easy to forget technical details, unless frequently confronted with them. The task is especially complicated by the diversity of such groups as tree farmers and professional foresters at the various levels.

Ground reporters and aerial observers in the detection system must be schooled on what to look for. Up-to-date educational material in the form of appropriate pamphlets and visual aids must be available to them at all times. Lectures must be given frequently in communities near the forested areas. Training, to be effective, must be pertinent and done repeatedly.

In many instances, the entomologist is called upon to recommend methods of control, plan the operations, and directly supervise the destruction of forest pests.

Almost every epidemic has involved both private and public lands. Each owner tends to do things his own way. Some owners are reluctant to take any action. The entomologist, then, must supervise and coordinate the entire program into a unified effort if control is to be effective. Practical and up-to-date methods must be recommended, and disinterested parties influenced to do their part in the overall plan.

Success in early detection, research, and control requires much more energy, information, and financial support than can be supplied by one individual organization, or agency. The entomologist should take the initiative in drawing together the activities of his own agency, private organizations, the U. S. Forest Service, and entomologists of neighboring states in ground and aerial detection surveys. There must be an exchange of information on insect trends and danger areas, ideas and future control plans. Achievements must be

[1]The information provided herein has been gained as a result of experience from six months' association with the Texas Forest Service as a consultant in entomology.

[2]On leave of absence from the New York State College of Forestry for special duty with the Texas Forest Service.

disseminated through publication.

As with other professional men, the entomologist must keep abreast in his subject as well as associated fields, through technical journals, scientific societies (entomological, forestry, pathological, chemical), and libraries. He must be up-to-date on what is being done in other agencies, other states, and other countries.

Summary

Some of the important responsibilities of an entomologist in a state forestry agency may be listed as follows:

1. Plan and take part in aerial and ground detection of forest insects. Train observers in methods of aerial and ground detecting and reporting.

2. Distribute timely warnings and pertinent information regarding the increase of forest insects.

3. Advise, counsel, and assist those concerned with forest insect problems.

4. Inform foresters, county agents, and forest owners by means of pamphlets, visual aids, and lectures.

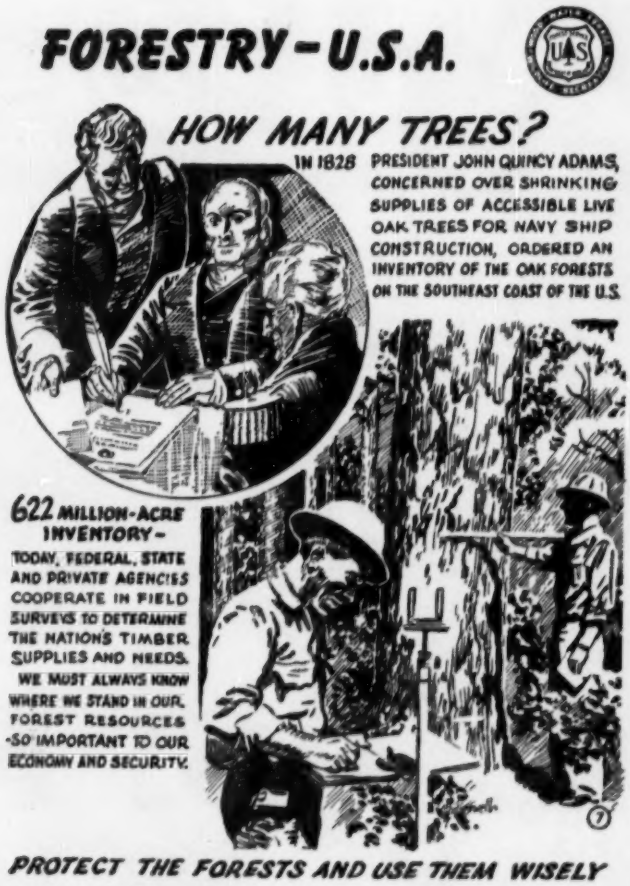
5. Recommend, plan and, where necessary, supervise the control of forest pests.

6. Stimulate, encourage, and participate in necessary research to the extent that time permits.

7. Coordinate research, detection, and control efforts with those of neighboring states, federal agencies, and private organizations.

8. Disseminate essential information pertaining to research, control projects, and other achievements.

9. Keep abreast in the field of forest entomology and phytopathology.


FORESTRY-U.S.A.
HOW MANY TREES?
IN 1828 PRESIDENT JOHN QUINCY ADAMS, CONCERNED OVER SHRINKING SUPPLIES OF ACCESSIBLE LIVE OAK TREES FOR NAVY SHIP CONSTRUCTION, ORDERED AN INVENTORY OF THE OAK FORESTS ON THE SOUTHEAST COAST OF THE U.S.
622 MILLION-ACRE INVENTORY-
TODAY, FEDERAL, STATE AND PRIVATE AGENCIES COOPERATE IN FIELD SURVEYS TO DETERMINE THE NATION'S TIMBER SUPPLIES AND NEEDS. WE MUST ALWAYS KNOW WHERE WE STAND IN OUR FOREST RESOURCES -SO IMPORTANT TO OUR ECONOMY AND SECURITY.
7
PROTECT THE FORESTS AND USE THEM WISELY

THE ABOVE CARTOON is one selected from a series entitled Forestry-U.S.A. that is being distributed by the Division of Information and Education of the U. S. Forest Service in connection with the Golden Anniversary Year of that organization.

Notes

Props in Photogrammetry

Miniature aerial photography can be a project activity for students of elementary photogrammetry or for anyone who is interested in demonstrating, at magnified scale, one or more of the basic photogrammetric principles. The method is not intended to replace instruction in true aerial photography but serves as a relatively inexpensive means of emphasizing the concepts of photogrammetry through exaggeration of relief and scale. The equipment required consists of a scale model, yardstick or metallic tape, and an ordinary camera. For example, if a 36-inch mailing tube, used to represent a chimney or tower of exaggerated height, is placed on a scale model, the result when photographed from successive camera stations can be used to demonstrate the principle of determining elevation differences by means of scaled differences in parallax.

The Exaggerated Effect of Tilt in a Photograph

An instructional advantage gained by miniature photography in addition to its availability and low cost is that "props" or extraneous objects may be added to a photographic scene for the purpose of producing control which could not be so easily obtained in true aerial photography. The purpose of this article is to emphasize certain exaggerated effects of tilt by means of a specially prepared set containing a scale model of a residential service center and objects which produce vertical lines.

A tilted photograph is difficult to distinguish, visually, from a truly vertical photograph. If one examines the scale model of Figure 1, and disregards the presence of the extraneous props which locate the nadir point of the camera, it becomes difficult to determine that the photograph is tilted. Also, if it were not for the slight eleva-

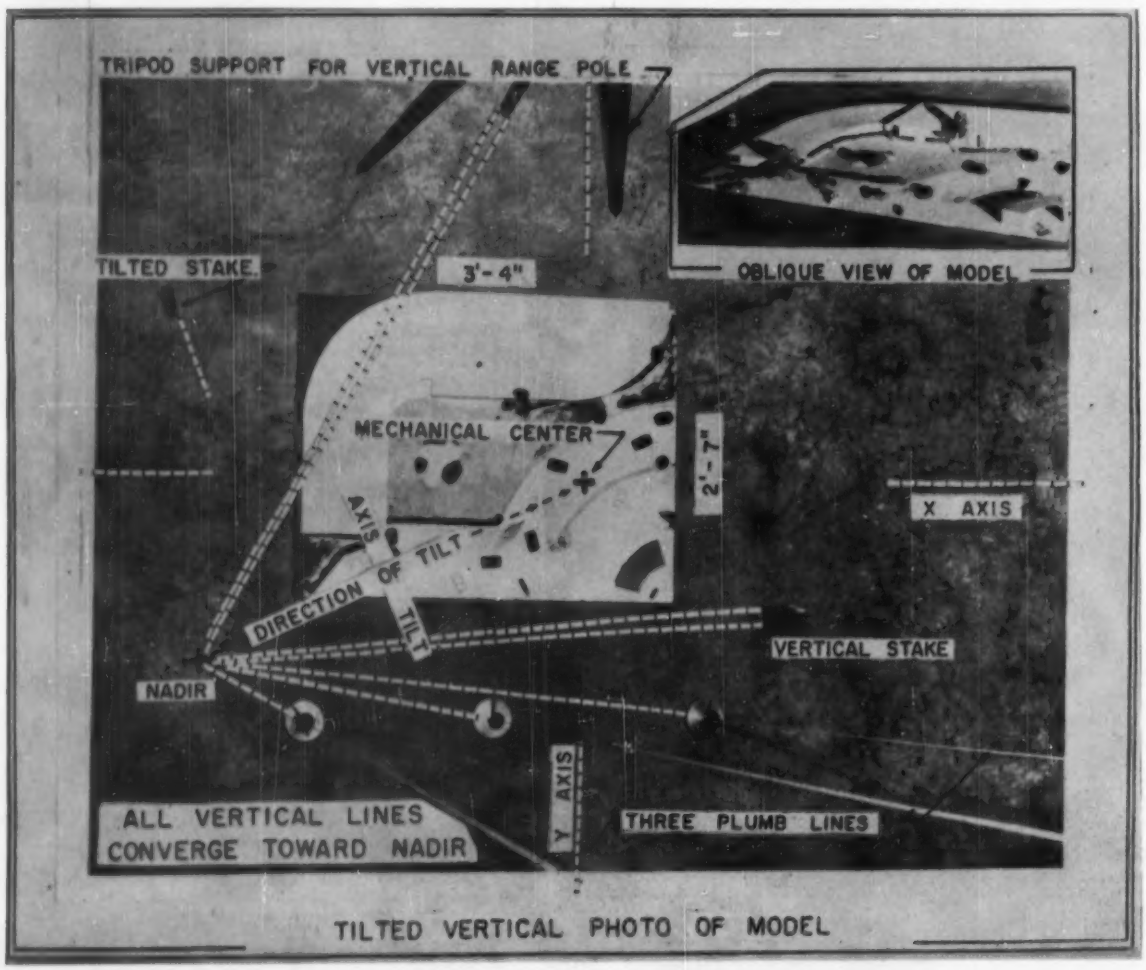


FIG. 1.—Tilted vertical and oblique views of scale model.

tion of the roof of the service center which casts a shadow, it would be difficult to judge the direction of tilt. Yet this photograph is tilted, for purposes of demonstration, far in excess of the ordinary run of tilted vertical photographs.

It has been said that everyone is versed in photogrammetry to a certain extent, otherwise our newspapers and magazines would not contain photographs. However, natural ability may not be sufficient to insure a beginning student complete understanding of a near vertical aerial photograph. Vertical photographs of natural terrain are usually of a scale such that object-images have dimensions so minute that elements of size, shape, shadow, shade, and texture, are barely discernible to experts. A ground object ten feet in diameter appears as a photo-image 0.004 inches in diameter when photographed from 20,000 feet by an eight inch focal length camera. Likewise, the effects of perspective and tilt, which tend to differentiate the aerial photograph from a map are, because of small scale, usually observable only as differences in micrometer measurements.

The example of a tilted photograph as illustrated in Figure 1, was obtained by flash exposure of a tilted, hand-held, six-inch focal length camera above the prepared scale-model setting. Props consisting of objects which produce vertical lines, i.e., the range pole, three plumb lines, and survey stake, were included to aid in locating the nadir or plumb point vertically beneath the camera lens and to emphasize the tilt of the photograph. The vertical lines converge toward the plumb point of the camera and illustrate the principle that "direction" of relief displacement is "radial" with respect to the "nadir" regardless of intentional or accidental tilt of the aerial camera. This is a fundamental concept of photogrammetry. Had the example been a truly vertical photograph, the nadir and the mechanical center would have been coincident.

There is no definite angular value of tilt that provides a sharp line of demarcation between vertical

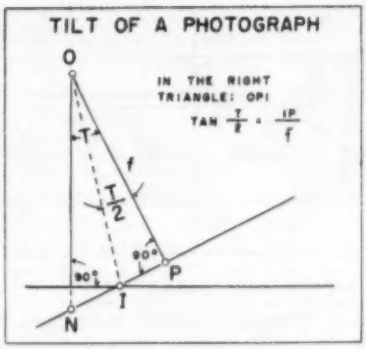


FIG. 2.—Diagram for calculation of tilt.

and oblique photographs, although photographs having a tilt of zero degrees to five degrees are generally considered in the vertical or near vertical category. The photograph of the scale model, Figure 1, is labeled as a tilted vertical photograph, it could also be termed as a low oblique since it has a tilt of approximately thirteen degrees. When the location of the nadir point of a tilted aerial photograph is known, the angular value of tilt can be calculated from a simple right triangle such as *OPI* in the illustration of Figure 2.

$$\text{Tan } \tfrac{1}{2}T = \frac{IP}{f}$$

Where, P is the mechanical center.
I is the isocenter marking the axis of tilt.
f is the focal length of the camera.

From the scale model example, using distances scaled from a contact print:

$$\text{Tan } \tfrac{1}{2}T = \frac{0.685}{6} = 0.114$$

$$\tfrac{1}{2}T = 6°30'$$
$$T = 13°$$

Miniature aerial photography can reproduce practically every basic principle encountered in conventional vertical and oblique photography and this "visual-aid" device is available to all who desire a closer look at photogrammetry.

A. N. WINSOR
Assistant Professor of Civil Engineering, University of Florida, Gainesville

How Tree Size Affects Time Needed to Prune Shortleaf Pine

Young shortleaf pine (*Pinus echinata* Mill.) planted in southern Illinois does not self-prune well. Even the dead, lower limbs may persist for several years in 10-to-15-year-old stands having 800 to 1,000 trees per acre. Since the trees can be pruned safely at a very early age, the question when to prune becomes an economic one. When can the job be done most efficiently and with the least expense? It is the purpose here to help answer that question.

The Central States Forest Experiment Station's Carbondale Research Center, in cooperation with the Shawnee National Forest, has established a pruning study in southern Illinois consisting of 15 plots totaling 6 acres in shortleaf pine plantations 10 to 14 years old.

In pruning these trees to a height of 8 to 9 feet, a 2-man crew was used. One man with a hatchet or small ax knocked off the low, dead branches and cut a few of the lower, live limbs. The second man pruned the higher limbs to 8 or 9 feet using a curved pruning saw with a 4-foot wood handle. Pruning the numerous lower, dead limbs with an ax proved to be easier and faster than with a saw. For the higher, live limbs, the saw was greatly superior.

The actual pruning time ranged from 13 to 26 man-hours per acre. The average was 19 man-hours per acre for 960 trees, or 1.2 man-minutes per tree. Pruning time, however, was about 1 man-minute per tree in plantations of smaller trees ranging from 2.1 to 3.1 inches in diameter at breast height (Fig. 1). Above this range up to about 4 inches average diameter, pruning time per tree increased rather sharply. Thereafter, it tended to remain constant up to 4.6 inches, the largest average diameter encountered.

The relationship between average tree size and pruning time can be explained on the basis of limb size and the percentage of dead limbs. In plantations of smaller-size trees

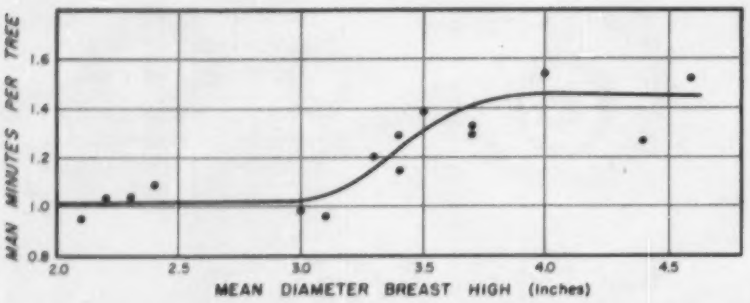


FIG. 1.—Scatter diagram showing relation of mean tree diameter in 15 plots to pruning time per tree—(Free-hand curve).

there were practically no dead limbs, and all had to be cut rather than knocked off. Trees less than 2.5 inches in diameter tended to bend with movement of the saw, thus increasing pruning time. At about 3.2 inches average diameter, limbs were large enough to increase pruning time. At about 4 inches average diameter, fewer live limbs were present because of natural pruning, which tended to offset the added time needed to prune the larger branches.

It seems apparent that trees with an average diameter of about 3 inches can be pruned more cheaply than those an inch larger, and just as cheaply as those an inch smaller. Furthermore, stands of trees averaging 3 inches can be pruned readily to 8 or 9 feet without taking more than about one-fourth of the live-crown length. But pruning 2- to 2.5-inch trees to the same height would remove about half of the live crown, and so perhaps reduce the growth rate.

So it would seem that initial pruning of shortleaf pine to 8 or 9 feet can be done most economically and efficiently when the trees average about 3 inches in diameter. Whether or not the cost would be justified on all trees would depend upon markets for posts or other small products where a clean stem is desired. On selected crop trees, the pruning expense may well prove to be justified.

LEON S. MINCKLER
Silviculturist, Carbondale Research Center[1]

[1]Maintained by the Central States Forest Expt. Sta., Forest Service, U. S. Dept. Agric., in cooperation with Southern Illinois University.

An Example of Tree-Length Skidding as a Silvicultural Tool

Three big problems in any logging operation are to avoid creation of a high fire hazard, to prevent damage to the residual stand, and to prevent the development of conditions that cause erosion or impair the productive capacity of the soil.

A high fire hazard results from the accumulation of slash and debris.

Damage to the stand comes from direct physical injury during felling and skidding operations. In most instances skidding is responsible for the major portion of such damage.

Damage to the soil, also, results when logs are skidded, disturbing the litter and humus layers in such a manner as to cause erosion, drying out of the soil, or creation of poor seedbed conditions.

It can therefore be concluded that the operation of skidding logs is responsible for a large portion of all logging damage. The general opinion that the longer the log the greater the damage would seem to be a reasonable further assumption, for a long inflexible object pulled in a curve passes over an area that resembles the chord of a circle. For instance, if a 32-foot log had to swing 90 degrees around an obstruction, and the pivot point was 12 feet from the end, it would cover or siwash an area of 1,798 square feet. Everything within this area would momentarily be levelled or else the log would break. Considerable damage to a residual timber stand might result. A 16-foot log going through the same maneuver would cover an area of 427 square feet.

Tree-length skidding, however, if done on a reasonably straight skidway pattern need not inflict this damage. It also greatly reduces the total amount of plowing and digging by the square-sawed ends of logs. There are fewer logs in the first place, and in the second place, if skidded top first, the result from a tree length log is abrasion, rather than digging.

Tree-length skidding, combined with planned felling; planned skid trails; and the placement of slash in the trails so that it was subject to abrasion from a controlled amount of skidding over it, was experimentally used on a timber sale in the Clearwater National Forest, Idaho. It is felt that beneficial results were obtained in reduced fire hazard, reduced damage to the residual stand, and prevention of damage to the soil. In addition, woods crew workers and the operators profited by an increased production rate and less equipment wear and damage.

Planning of skid trails and felling.—The first step taken was to locate all skid trails in advance of other operations. This was to make them as straight as possible, and where curves were necessitated by terrain to place them so as to have the longest possible radii. By careful location of the trails with skidding possibilities in mind only a minimum amount of construction work on them was required.

Because of this prior completion of the trails, the sawyers were aided in judging where to fell the trees. Instructions were to drop the stems in such a position that they could enter the skid trails at an angle of no greater than 45 degrees, resulting in negligible "siwashing."

This systematized operation proved to be beneficial to the crew, whose members were all working on a piece basis, because of increased production. They were impressed by the ease with which tim-

ber was moved from the stump to the landing. The operators in turn noticed less broken rigging and less wear on equipment because of fewer "hangups."

All crews were closely supervised at the beginning of the cutting. When a tree could not be dropped for easy skidding it was bucked into shorter lengths as a precaution against skidding damage.

Placement of slash in skid trails.—A second major feature of the operation was to start cutting at the back of the skid area and progress toward the landing with as many tops as possible dropped into the skid trails by falling operations. These tops were then subject to the abrasive effect of having only one or two tree-length logs skidded over them. This was enough to partially grind them and mix them with the soil but not enough to force them out of the trail or expose bare soil.

Although less than 50 percent of the stand volume was removed, there was always an ample amount of debris on the trails to achieve the desired results. The depths of the mixed litter-and-soil layer varied from six inches to better than two feet. This mixture had good moisture holding qualities. Test holes dug into the trail surface following a six weeks period with no quantity of precipitation showed good moisture content. Inspection following a five-day period of intermittent rain with some periods of heavy precipitation showed no erosion on the trails. Though the soil was saturated, the trail surface had the same springy feel when walking over it, as undisturbed litter in the forest.

A large percentage of the slash on the area ended up on the skid trails in a condition where it could no longer be classed as a fire hazard.

Obviously, because of topography, this method of logging has but limited use in partial cutting in the white pine forests of north Idaho.

Authors note.—Many of the conclusions in this article were deducted from observations made on the sale area by the late Dr. Hubert of the University of Idaho and Charles Wellner of the Northern Rocky Mountain Experiment Station.

BERT W. MORRIS
Forester, Administration
Flathead National Forest
Kalispell, Mont.

Galen W. Pike (1902-1955)

GALEN W. PIKE

Galen W. Pike, supervisor of the Superior National Forest in Minnesota, died of a heart attack on July 27 while on a canoe trip on Lac La Croix.

Born May 29, 1902, at Brentwood, N. H., he received the B.S. degree in forestry from the University of Idaho in 1927, and the M.F. from Yale in 1928. Entering the U. S. Forest Service in the latter year, he rose through the ranks from ranger in the Black Hills to supervisor of the Shawnee Purchase Units in Illinois and lately of the Superior National Forest.

In the latter position Mr. Pike became a specialist in the administration of wilderness areas and in wildlife management.

He served as chairman both of the S.A.F. Upper-Mississippi Valley Section and of the Wisconsin-Michigan Section; and was a former secretary of the Division of Forest-Wildlife Management.

Planting Conifers in the Higher Appalachians

A 32-year-old planting trial near Mt. Mitchell in North Carolina provides information on the suitability of various conifers for reforestation at the higher elevations in the Southern Appalachians. This progress report is based upon a 1953 remeasurement of this experimental planting, established by the U. S. Forest Service and currently administered by the Southern Appalachian Research Center of the Southeastern Forest Experiment Station.

The highlands of the southern Appalachians once included more than 1½ million acres of dense spruce-fir forest. Destructive cutting practices and logging methods, followed by fire, erosion, and invasion by competing species, have reduced this type to less than 100,000 acres. This area has long been of interest to silviculturists, with periodic consideration of possible reforestation measures. Direct planting has given the most promising results and therefore has received the most attention.

The species test here reported includes 17 coniferous species, planted in 76 tenth-acre plots at an elevation of 5,600 feet in the Black Mountains of North Carolina. These plots are divided into two planting blocks (A and B) which hold 34 and 42 plots respectively and are located on south and east aspects. Although the data reported in this paper were taken from block B exclusively, observations of block A indicated that for the most part similar conditions prevail there also.

Results from this experiment are limited by the small size of the plots and the lack of isolation strips. The conclusions, however, concerning what species to plant and where to plant them are believed to be valid. More research must be conducted before adequate growth data will be available.

In 1953, each tree was evaluated for vigor (past and present), general overall condition, height and form. The trees were classed as

TABLE 1.—1953 MEASUREMENTS OF BLOCK B OF CLINGMANS PEAK PLANTING EXPERIMENT

Species	Condition[1] G	F	P	D	Approximate height	Age	Trees measured
	Percent				*Feet*	*Years*	*Number*
Fraser fir	69	6	3	22	35-40	29	100
Norway spruce	60	8	4	28	30-35	30	100
Red spruce	58	6	6	33	35-40	29	100
Red pine	46	12	3	39	30-35	27	200
Pitch pine	44	18	4	34	35-40	30	100
European silver fir	28	19	13	40	15-20	29	100
Northern white-cedar	46	9	4	31	10-15	28(25)	169
Scotch pine	21	6	0	73	25-30	27	100
White spruce	5	7	3	85	.....	29(26, 24)	300
Douglas-fir	7	3	5	85	-	30(24)	200
Japanese larch	8	1	1	90	-	29, 23, 25	300
White fir	0	0	5	95	-	26	100
European larch	0	3	0	97	-	29	100
Western white pine	0	0	3	97	-	30, 26	200
Japanese red pine	0	0	0	100	-	29, 25	200
Lodgepole pine	0	0	0	100	-	27	100
Japanese black pine	0	0	0	100	-	30	100

[1]Good, fair, poor, dead.

being good, fair, poor or dead. For each plot average height[1], competition, forest floor and soil conditions were recorded.

The soils appear to be essentially uniform over the complete block. The soil, classified as *Porters soil material*, is of a residual nature, developing from igneous and metamorphic rocks. It is characteristically shallow with bedrock within two feet of the surface.

The climate of the spruce belt of the southern Appalachians is similar to that of the spruce forests of the northeastern United States, except for the higher rainfall and relative humidity of the southern belt.

Of the 17 species used in the test, only four (Table 1) combine promising survival, growth, and form. These species, in order of their success are, Fraser fir (*Abies fraseri*), Norway spruce (*Picea abies*), red spruce (*Picea rubens*), and red pine (*Pinus resinosa*). Pitch pine (*Pinus rigida*) gave inconsistent results in that the trees on one plot died at the age of 19 years with no apparent cause while the same species on the other plot was in excellent condition at the time of the 1953 study. Three other species (European silver fir, northern white-cedar, and Scotch pine) were eliminated from consideration because of the poor form in the test area.

Use of any one of the four successful species in a reforestation program should be governed by the goal of the program involved. Special limitations are imposed by the form, growth rate and survival, as well as from the physical-chemical properties of the wood. Fraser fir is well suited for use in most reforestation programs, the exception being where saw timber is the goal of the program (the species has a low lumber value). Norway and red spruce are good for use in any program. Red pine should be considered only in the case of watershed protection or roadside plantings unless pruning can be done. It may, however, be considered for pulp production.

In actual practice, each of these species will give best results on a given site, or topographic position (Table 2). Though the devastated spruce areas present extremely adverse conditions for reforestation, unusually large and vigorous planting stock is not necessary. High quality stock, however, should be used. Planting should not be done unless release work can be carried out, preferably during the third and fifth growing seasons. Release work done at this time is almost always a necessity, and will allow the trees to establish themselves in a dominant position more rapidly.

CARL B. DALTON[2]
School of Natural Resources
University of Michigan, Ann Arbor

[1]Average height is based on the 10 center trees in each plot to minimize side effects. The trees were measured with a telescopic aluminum rod which extended to the height of 35 feet.

TABLE 2.—RECOMMENDATIONS FOR ARTIFICIAL REFORESTATION IN THE SPRUCE-FIR REGION OF THE SOUTHERN APPALACHIANS

Topography and soil conditions	Suggested species
The higher drier ridges, characterized by the shallow, dry soils	Fraser fir
The lower ridges, characterized by moderately deep soils but dry conditions	Red pine
The intermediate, well-drained slopes	Red spruce
The lower slopes and moist coves	Norway spruce

[2]Appreciation is due W. G. Wahlenberg and the Southeastern Forest Experiment Station, U. S. Dept. Agric. for making past records of this experiment available.

Baldcypress on Theodore Roosevelt Island Planted

In the June 1953 issue of the JOURNAL OF FORESTRY, in an article entitled "Natural Occurrence of Baldcypress on Theodore Roosevelt Island" I theorized that these trees occurred naturally from waterborne seed. Since then, correspondence with Olmsted Brothers, Landscape Architects, who have served as consultants in plantings on the island, has established the fact that the trees were planted. According to their records, approximately between 1934 and 1937 two lots of baldcypress trees were planted in the marsh at the south end of the island. There are no records of the number planted.

HORACE V. WESTER

Points of View

Comments on "Forest Production in a Dynamic Economy"

In the June issue of the JOURNAL[1] Dr. Worrell's presentation of a model that demonstrates the importance of time in analyzing forest growth-drain relationships was commendable. Truly a view of future demand and supply conditions is necessary to appraise the adequacy of current forestry practices.

Without desiring in any way to detract from this contribution, a fundamental postulate of the model should not pass unchallenged. As Dr. Worrell indicates, the adequacy of current growth cannot be appraised in terms of what we are cutting today. But a *volumetric* comparison of today's growth and probable future *consumption* is also of little or no value as data fundamental to sound policy decisions. Dr. Worrell simply didn't go far enough—growth-consumption (sustained-yield) comparisons, either current *or* over time, contribute little to our knowledge of whether or not our forestry program is adequate.

It is inevitable that growth and consumption will eventually be equated, and thus "sustained-yield over time" achieved. In fact, current production will largely *determine* future consumption, thus forcing a balance. For, over prolonged periods it is obviously physically impossible to cut more than has been grown. And on the other hand over periods as prolonged as several decades it is highly unlikely that we will cut less than has been grown, because if actual demand develops to be less than was anticipated when the stands were being established and grown, stumpage prices will fall and wood will find new markets as a raw material of lower value. Even though timber growers may have large sums invested in stumpage at the time it matures, if there is no reason to feel that future prices will rise considerably the stumpage will be sold at whatever price the then current market conditions produce. For even if this means a loss there is no reason to hold it longer if future markets hold no promise to reduce this loss.

If the volume of current production will in fact always determine the volume of future consumption then little is to be learned from comparing projected trends in consumption with current production. If Worrell's conclusion that "ideally the national growing stock should be regulated so the production is increasing at the same average rate as consumption" were followed, once a trend in total wood consumption was selected, public policy would insist that production follow it. And since current production determines future consumption this trend in consumption supposedly would be maintained indefinitely, depending only on the base period selected to determine the trend. Obviously such a method for determining production policies is weak—something is missing. This something is the consideration of costs required to grow various quantities of timber and the resulting prices (or value) when these volumes reach the market.

What sort of public policy is it that urges landowners to grow more timber knowing only that it will be consumed if grown? Should not the public be as much concerned with the value of the products produced and the physical costs required to produce them as is the landowner?

In summary, although present production must be based on estimates of future market conditions, a proposal that bases public growth goals on volumetric comparisons of growth and drain (or consumption) without considering ultimate product values and costs of production is certainly inadequate. As markets and production techniques vary, regulation of the national as well and individual-landowner growing stock should vary. Under such conditions "sustained yield" and equilibrium concepts are useless. Our forest economists must be called upon continuously to analyze probable future demand and supply conditions in order to indicate probable prices and values, and our forest managers to estimate the corresponding costs required to produce various volumes. Only when such information is provided can intelligent public or industrial production decisions be made.

C. H. STOLTENBERG
Duke University
Durham, N. C.

[1]Worrell, Albert C. Forest production in a dynamic economy. Jour. Forestry 53:447-450. 1955.

Comments on "The Role of a Regional Agency in Forest Fire Control"

John Lehman and Ralph Vogenberger have presented an excellent story of fire control activities in the Tennessee Valley in the June JOURNAL OF FORESTRY.[1] A careful reader of the article will observe that progress was made in every phase of fire control except in the overall reduction of the number of fires. The story is silent on the question of weather. It is well known that 1952 and 1953 had very dry weather but the 1930's also did. It is also silent on risk increase caused by population rise.

The authors recognize that a reduction in the number of fires remains the first priority job in the Valley. They pose two questions, "What are the reasons behind the causes" and "How to reduce the number of fires."

The first of these questions has been given careful thought in sev-

[1]Lehman, John W., and Ralph A. Vogenberger. The role of a regional agency in forest fire control. Jour. Forestry 53: 430-435. 1955.

eral instances in the past. Dr. John Shea, psychologist, studied fire causes in the Appalachian area and wrote a comprehensive report on his findings.

It must be apparent to a close observer that one phase of fire prevention is conspicuous by an almost total lack of any reference to it. This is the law enforcement situation. Records show a relatively small percent of state fire cases have been initiated either in court or by collection of suppression costs and damages (less than 7% in 1953 for all states in the nation).

The authors say "the reasons why so many people permit woods to burn still remains an enigma." In some cases, the reasons are surely an enigma and they may always remain so. With our rapidly increasing population enigmas are being born faster than our ability to understand them. Regardless of the reasons for fires, records of fire occurrence in various areas show that when a consistent, continuing, and well conducted program of law enforcement is carried out as a "clincher" to a good educational effort, the number of fires will be reduced, especially those fires considered as incendiary or gross negligence.

President Demmon says in his column on page 464 of the June JOURNAL "there has been little reduction in the actual number of fires reported each year for the last 25 years," and "laws relating to carelessness with fire and incendiarism must be . . . more strictly enforced."

The stage is set for the persons responsible for fire prevention in the Tennessee Valley to decide upon, initiate, and carry out an adequate program to enforce the fire laws of the respective states.

HENRY SIPE
Assistant Supervisor,
Monongahela National Forest
Elkins, W. Va.

❦❦❦

SECTION BOX SCORE[1] 1955 MEMBERSHIP

Section	Applications received[2] Sept. 1955	Total 1954	Total 1955
Allegheny	0	72	43
Appalachian	1	69	9
Central Rocky Mountain	0	26	6
Central States	1	115	19
Columbia River	1	57	68
Gulf States	2	63	82
Inland Empire	0	40	8
Intermountain	0	15	18
Kentucky-Tennessee	0	5	5
New England	0	54	40
New York	0	39	32
Northern California	0	24	29
Northern Rocky Mountain	0	34	37
Ozark	1	42	19
Puget Sound	1	69	50
Southeastern	4	130	36
Southern California	0	2	3
Southwestern	0	7	11
Upper-Mississippi Valley	0	55	34
Washington	0	8	2
Wisconsin-Michigan	0	13	24
Totals	11	939	575

[1]Adjusted to new record year—now calendar-year basis.

[2]Student, Junior, Affiliate, Associate (initial) grades only.

SCHOOL BOX SCORE[1] 1955 MEMBERSHIP

School	Student applications received Sept. 1955	Total 1954	Total 1955
Alabama Polytechnic Institute	0	25	0
University of California	0	11	17
Colorado A & M College	0	18	5
Duke University	0	13	2
University of Florida	0	8	7
University of Georgia	2	35	13
University of Idaho	0	29	4
Iowa State College	0	21	15
Louisiana Polytechnic Institute	0	0	13
Louisiana State University	0	14	30
University of Maine	0	20	12
University of Massachusetts	0	12	4
Michigan State College	0	43	10
University of Michigan	0	28	14
University of Minnesota	0	23	11
University of Missouri	0	14	3
Montana State University	0	19	21
State University of New York	0	22	23
North Carolina State College	0	39	0
Oregon State College	0	18	19
Pennsylvania State University	0	37	32
Purdue University	0	26	4
Utah State Agricultural College	0	9	12
University of Washington	1	35	23
West Virginia University	0	22	6
Yale University	0	4	16
Totals	3	545	316

[1]Adjusted to new record year—now calendar-year basis.

Reviews

Soil and Water Conservation Engineering

By Richard K. Freuert, Glen O. Schwab, Talcott W. Edminster, and Kenneth H. Barnes. 479 pp. Illus. John Wiley and Sons, Inc., New York. 1955. $8.

This is another book in the Ferguson Foundation Agricultural Engineering Series. The authors are professors of agricultural engineering at Iowa State College, except Mr. Edminster who is agricultural engineer, Soil and Water Conservation Research Branch, Agricultural Research Service.

Even though the authors designed the materials in this volume to be used as a professional agricultural engineering text, the book should serve as a valuable working tool for field conservation engineers, foresters, and soil conservationists.

Soil and water conservation engineering problems are divided into the following five phases: erosion control, drainage, irrigation, flood control, and land clearing. A chapter is devoted to each of these phases, but there are seventeen additional chapters treating variants of the principal phases, plus general land and water use principles, legal aspects of soil and water conservation, and an appendix. Each chapter has a list of references and several problems for study.

This volume should be of considerable interest to those technicians concerned with water use and control, especially flood control. Extensive use has been made of the most recent research findings in these fields by the Soil Conservation Service and the Agricultural Research Service.

Considerable attention is given to soil as a primary material with which agricultural engineers must work. There is included a rather lengthy chapter on soil physics, discussing mechanical properties, soil moisture, soil moisture movement, and measurement of soil permeability.

The authors have presented in a very concise fashion most of the primary engineering principles utilized in working with soil and water conservation engineering problems. These have been kept free of illustrations of application to other fields. Therefore, it would appear to be a well designed book for the purpose of teaching and providing the field technician with a good manual in soil and water conservation engineering.

T. B. PLAIR
Soil Conservation Service

Field Book of American Wildflowers

By F. Schuyler Mathews, revised by Norman Taylor. 601 pp. Illus. G. P. Putnam's Sons, New York, N. Y. 1955. $5.

Originally published in 1902, this well known book of the wildflowers of eastern and central North America is still one of the most dependable and convenient guides for the amateur botanist. It is simple and concise, and profusely illustrated with black and white drawings together with 30 color plates.

Species are arranged and described by families, based principally on leaf and flower characteristics. Habitats and ranges are listed, and frequent mention is made of the insects assisting in fertilization.

In order to keep the book at a manageable size, most trees and shrubs, and all ferns, grasses, sedges, and rushes have been left out. Still, a couple thousand plants are described.

A useful color guide assists in the identification of flowers and fruits. A glossary of terms helps understand the scientific language, which however is kept to a minimum. There is a very complete index of botanical as well as common names.

Over the years nearly 150,000 copies of this guide have been sold. Its popularity is deserved.

Influences of Reforestation and Erosion Control upon the Hydrology of the Pine Tree Branch Watershed 1941 to 1950.

Tennessee Valley Authority, Knoxville, Tenn. 95 pp. Illus. 1955. $1.50.

Over the past 20 years, TVA's Hydraulic Data Branch has been assessing the hydrologic effects of land stabilization on fully controlled watersheds. Technical Monograph No. 86 presents findings on the 88-acre Pine Tree Branch watershed, a West Tennessee basin typical of a large area of very erosive loessial soils, where serious floods and siltation have impelled public agencies to expend large sums to restore the commonly abused land and to encourage less damaging practices. The original survey, by TVA's Division of Forestry Relations, found most of the original surface soil gone and numerous narrow gullies with nearly vertical sides up to 10 feet high.

Before treatments commenced in 1945, 23 percent of the area was forest, 47 percent abandoned and idle, 19 percent pasture, 9 percent cultivated, and 2 percent miscellaneous. None of the land was free of surface runoff and erosion. Its restoration required minor engineering to supplement planting with several species of pine, and minor amounts of hardwoods. Lovegrass was also successfully seeded, and fertilizer and pine mulch applied for early soil protection. Protection from fire, grazing, trespass, insects and disease bolstered the other measures. By 1950, forest occupied over 98 percent of the terrain, providing effective soil cover on 85 percent.

From 1941 (when measurements began) through 1950, damaging surface flows were reduced from 69 percent of the total yield to 44 percent, while beneficial subsurface flow increased from 31 percent to 56 percent of the total. Peak flows decreased from a pretreatment maximum of 244 cubic feet per sec-

ond to a post-treatment high of only 58 c.f.s. (Twenty-one peaks 58 c.f.c. or greater occurred before treatment.) These average reductions apply to the range of rainfall volumes and intensities, to wet as well as dry soils, and to winter as well as summer conditions. The significant winter reductions are attributed to evapotranspiration by the conifers—an observation confirmed by soil moisture research elsewhere in the South. The time distribution of storm runoff has also been lengthened by from 60 to 103 percent over that from similar volumes before treatment. This change is another significant indicator of improved streamflow. The apparent slight decrease in total water yield following the increase in vegetation will need confirmation from subsequent data.

The reduction in total sediment movement from 24.2 tons per acre per year to only 2.5 tons—reflects the combined effect of reduced soil movement into channels and reduced surface runoff. For exampde, in 1950 the tonnage of suspended sediment from 2.0 inch summer storms of high intensities falling on wet ground was 92 percent less than in the pretreatment period; for comparable winter storms the reduction averaged 94 percent.

Although this monograph yields no new principles, it does represent a material contribution to the growing scientific literature on streamflow behavior under specific conditions. As the study reaches the point where conservation agricultural and forestry practices are applied and tested, the results should be even more meaningful. Since the watershed may need some time to recover before intensive practices can safely be initiated, it may be worth considering the selection of another watershed of loessial soils already in reasonably stable condition. (The hydrologic effects thus far of the current conservation program on the 134-square mile Chestuee Creek watershed in Tennessee offer such promise for an area of sedimentary soils.)

Altogether, studies of this kind are furnishing criteria for appraising watershed management (as distinguished from improvement) programs that can stand the test of technical scrutiny. Except for a relatively few research and precalibrated demonstration watersheds, the objective substantiation of such programs remains unfinished business.

BERNARD FRANK

Geography of the Northlands

George H. T. Kimble and Dorothy Good, editors. 534 pp. Illus. John Wiley & Sons, Inc. New York. 1955. $10.50.

At a time when the Arctic and Subarctic are constantly becoming of greater importance in world affairs, this book is an effort toward a new survey of the region. None had been made for some twenty years. It makes no claim to completeness in any single phase, but rather aims to produce a working sketch upon which later workers can enlarge.

Fourteen specialists on the northlands wrote the various chapters. The material is handled in two ways. First, the general characteristics of the Arctic and Subarctic as a whole are considered under 12 heads. These include such things as physiography, water masses, weather, marine life, and aboriginal populations—subjects which can best be treated on an overall basis. Then the whole area is discussed in 14 regional studies giving the salient features of each. Each chapter has a selected list of references. One appendix covers outstanding discoveries in the Arctic and Subarctic while another contains common and scientific plant and animal names.

The text is easily understandable and gives a good, general account of the northlands, their climate, vegetation, animal life, people, and resources. In some of the maps of the circum-polar region it is difficult to distinguish land from water or to identify given lands. However, this is a very minor fault and anyone interested in this part of the world is bound to profit from reading the book.

N. W. HOSLEY
University of Alaska

Composition of Scientific Words

By Roland Wilbur Brown. 882 pp. Published by the author. U. S. Geological Survey, Washington 25, D. C. 1954. $8.

The author, Dr. Brown, officially is geologist, U. S. Geological Survey; for practical purposes he is the distinguished paleobotanist in the U. S. National Museum.

This unique book is defined on the title-page as "A manual of methods and a lexicon of materials for the practice of logotechnies" which, being interpreted, may be said to be the art or science of "manufacturing" scientific and technical terms. As such it is a greatly enlarged and modified revision of the author's earlier (1927) "Materials for Word-study."

The first 61 pages are foreword and introduction covering a potpourri of information, including notes on the history and nature of the English language, diacritical marks, Greek and Latin words, warnings, gender, and spelling and pronunciation. The bulk of the book is the alphabetical "Cross-reference Lexicon," starting with the prefixes *-a* and Greek *aages* and ending with the Latin *zythum*, followed by a bibliography and index.

An extraordinary amount of labor and scholarship has gone into this compilation. Anybody interested in words and their meaning, and in having a help in coining new words, will find it an invaluable reference. Moreover, the introductory matter, here and there enlivened by the author's dry wit, contains much that is entertaining and all of it instructive.

W. A. DAYTON
U. S. Forest Service

Graduate Theses, 1944-1954

Compiled by Genevieve L. Reidy. 116 pp. State University of New York, College of Forestry, Syracuse, N. Y. 1955. (Free.)

Included in this informative bulletin are abstracts of all the 150 graduate theses accepted at the College of Forestry during the period 1944 through 1954. Also included

is an appendix listing by title some 250 theses accepted during the period 1914-1943.

All in all these 400 titles comprise an impressive record of graduate work of which the College is understandably proud. They represent nine categories of specialization: forest botany and pathology; pulp and paper technology; silviculture; economics and management; entomology; utilization; wood technology; and landscape engineering and recreation management.

This bulletin is a helpful supplement to the bibliographies of collegiate, federal, and state experiment stations. It is all the more valuable in that it provides information on material usually accessible in typescript only.

HENRY CLEPPER

Knowing Your Trees

By Warren D. Brush and G. H. Collingwood. 328 pp. American Forestry Association, Washington, D.C. $6.

This old standby on tree identification is now available in a new and enlarged edition. Its previous popularity can be summed up by noting that this is its 15th printing and that 100,000 copies have come off the press in 18 years.

In this new edition the number of tree species covered has been increased by 12 and now numbers 162. Comparisons between species have been sharpened to bring out differences and similarities more clearly. Timber stand and lumber cut figures have been brought up to date. Many of the photographs used previously have been replaced, the index has been expanded, and a large map showing hardiness zones has been added.

As before, *Knowing Your Trees* contains detailed descriptions necessary to species identification and general information about each tree-range, economic importance, characteristics of its wood, use by wildlife, special insect enemies and other pertinent facts. The closeup photographs of fruit, leaves, and bark taken by Dr. Brush are notable for their clarity of detail and have won wide acclaim for the photographer.

Publications of Interest

Native Land is a 48-page booklet published by the National Association of Manufacturers for the purpose of pointing out the vital importance of our renewable natural resources. It is primarily suited to classroom use and makes extensive use of photographs to tell its story. Introduced by a brief description of the role of land use in the history of nations, individual sections give information on soil, forests, water, wildlife, and parks. A brief description of career opportunities for young people is given. Copies available at 10 cents from N.A.M., 2 East 48th St., New York 17, N. Y.

* * *

A valuable contribution to better management of western rangelands is made by the publication of *Seeding Rangelands in Utah, Nevada, Southern Idaho, and West Wyoming*. This handbook supersedes Farmers Bulletin 1823, "Reseeding Rangelands of the Intermountain Region." Written by A. Perry Plummer, A. C. Hull, Jr., George Stewart, and Joseph Robertson, all of the Intermountain Forest and Range Experiment Station, U. S. Forest Service, the bulletin (73 pages) is designated Agriculture Handbook No. 71 and is on sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. at 30 cents per copy.

Ten Commandments for Technical Writers

At the last session of the Conference on Scientific Editorial Problems at the AAAS Berkeley meeting, Elmer Shaw read these ten commandments for technical writers. He wrote them as a result of listening to the speakers in the first-day sessions.

(1) Thou shalt remember thy readers all the days of thy life; for without readers thy words are as naught.
(2) Thou shalt not forsake the time-honored virtue of simplicity.
(3) Thou shalt not abuse the third person passive.
(4) Thou shalt not dangle thy participles; neither shalt thou misplace thy modifiers.
(5) Thou shalt not commit monotony.
(6) Thou shalt not cloud thy message with a miasma of technical jargon.
(7) Thou shalt not hide the fruits of thy research beneath excess verbiage; neither shalt thou obscure thy conclusions with vague generalities.
(8) Thou shalt not resent helpful advice from thy editors, reviewers, and critics.
(9) Thou shalt consider also the views of the layman, for his is an insight often unknown to technocrats.
(10) Thou shalt write and *rewrite* without tiring, for such is the key to improvement.

ELMER W. SHAW

Rocky Mountain Forest and Range Experiment Station, U. S. Forest Service, Fort Collins, Colorado

Reprinted from Science, April 15, 1955, Vol. 121, No. 3146

Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University of New York College of Forestry*

Range Management Section Compiled by FRANCES FLICK, *Library, U. S. Department of Agriculture*

General

The Biltmore Story. By C. A. Schenck. 224 pp. Illus. American Forest History Foundation, St. Paul 1, Minn. 1955. $3.95.

Chemical Debarking of Trees. 18 pp. Illus. American Pulpwood Association, 220 E. 42d St., New York 17. 1955. Training Guide No. 5. 50 cents.

Forestry and Related Research in North America. By F. H. Kaufert and W. H. Cummings. 271 pp. Society of American Foresters, Washington 6. D. C. 1955. $5.00 ($3.00 to members)

Timbers of South East Asia. By Gerald Hart. 91 pp. Timber Development Association, Ltd., 21 College Hill, London, E. C. 4. 1955.

Forest Economics

Economics of Forestry; A Bibliography for the United States and Canada, 1948-1952. By F. J. Flick. 136 pp. U. S. Dept. of Agric., Washington 25, D. C. 1955. Library List No. 52, Sup. 1. Mimeog.

Forest Management

Combined Taper and Volume Tables for Pinus Radiata . . . By G. Duff and S. W. Burstall. 72 pp. New Zealand Forest Serv., Wellington. 1955. New Zealand Forestry Research Note No. 1.

A Forest Survey Method. By H. E. Seely. 15 pp. Canada Dept. of Northern Affairs and National Res., Ottawa. 1955. For. Res. Div. Tech. Note No. 8.

Forest Resources

Forest Statistics for New York Forest District No. 15. 19 pp. Northeastern Forest Expt. Sta., Upper Darby, Pa. 1954. For. State Ser: N. Y. No. 15. Mimeog.

National Forests of the Southern Region; A Report of Progress 1934-1954. 23 pp. Illus. U. S. Forest Serv. Region 8, Atlanta, Ga. 1955.

Timber in Humboldt County. By H. J. Vaux. 55 pp. Illus. Calif. Agric. Expt. Sta., Berkeley. 1955. Bul. No. 748.

Logging and Milling

Use and Care of Power Saws. American Pulpwood Association. 27 pp. Training Guide No. 4.

Protection

Minor Forest Pests. By W. H. Bennett. 4 pp. Texas Forest Serv., College Station. 1955. Cir. No. 44.

An Observation of Weevil Damage in Norway Spruce. By M. J. Holst. 3 pp. Canada Dept. of Northern Affairs and National Res., Ottawa. 1955. For. Res. Div. Tech. Note No. 4.

Pales Weevil. By W. H. Bennett. 4 pp. Texas Forest Serv., College Station. 1955. Cir. No. 41.

Pine Bark Beetles. 12 pp. Cir. No. 43.

Texas Leaf-Cutting Ant. 4 pp. Cir. No. 44.

Range Management

Forage Weight Inventories on Southern Forest Ranges. By R. S. Campbell and J. T. Cassady. 18 pp. Illus. U. S. Forest Serv. Southern Forest Expt. Sta., New Orleans, La. Occasional Paper No. 139. 1955.

Reseeding Abandoned Crop Land or Depleted Range Areas in Eastern New Mexico. By D. R. Burnham. 13 pp. N. Mex. Agric. Expt. Sta., State College. Bul. No. 395. Jan. 1955.

The Short Grass Prairies of Western Canada. By W. Eggleston. Canadian Geographical Jour., Ottawa. Vol. 50, pp. 134-145. Illus. April 1955.

Texas Range Plants Poisonous to Livestock. By O. E. Sperry and Others. 47 pp. Illus. Tex. Agric. Expt. Sta., College Station. Bul. No. 796. February 1955.

Silviculture

Agreements on Afforestation in the Lake District . . . 10 pp. Great Britain Forestry Commission, London. 1955. 6d (H. M. Sta. Office)

Collection and Storage of Ash, Sycamore and Maple Seed. 9 pp. Great Britain Forestry Commission, London. 1955. Leaflet No. 33. 6d. (H. M. Sta. Office)

Cone Collecting for Quick Cash Profits. Illus. folder. Florida Board of Forestry, Tallahassee. 1955.

A Field Test of Tetramine Treated Douglas Fir Seed. By E. F. Hooven. 17 pp. Illus. Oregon State Board of Forestry. Salem. 1955. Res. Note No. 21.

Growth and Yield of Slash Pine Plantations in Florida. By R. L. Barnes. 23 pp. Univ. of Florida School of Forestry, Gainesville. 1955. Res. Rept. No. 3.

Soil Factors Related to Growth and Yield of Slash Pine Plantations. By R. L. Barnes and C. W. Ralston. 23 pp. Illus. Florida Agric. Expt. Sta., Gainesville. 1955. Bul. No. 559.

Wood Technology and Utilization

Beech for Fuel and Charcoal. By L. E. Webber. 7 pp. Illus. Northeastern Tech. Committee on the Util. of Beech in coop. with Northeastern Forest Expt. Stn., Upper Darby, Pa. 1955. Beech Util. Ser. No. 12.

Bibliography of Wood Distillation, 1907-1953. By J. D. Ross. 55 pp. Oregon Forest Products Lab., Corvallis. 1955. Mimeog.

De Invloed van het Stomen op het Drogen van Hout. (*The Influence of Steaming on Drying of Wood*) With English summary. By J. Rogister and L. E. Eeckhout. 17 pp. Het Laboratorium Rijkslandbouwhogeschool voor Houttechnolgie, Ghent, Belgium. (1954)

Experiments in the Manufacture of Newsprint from Cottonwood and Willow. By G. H. Chidester, R. J. Seidl and E. R. Schafer. 10 pp. Tables. U. S. Forest Products Lab., Madison, Wis. 1955. Rept. No. 2028. Mimeog.

On Measurement of Toughness in Timber; Some Preliminary Investigations. By Franz Kollman. 40 pp. Manager of Publications, Delhi, India. 1954. Indian Forest Bul. No. 167. Rs. 2-14-c or 4 sh.9d.

A Statistical Method for Analysis of Factor Relationships Between Two Sets of Data. By S. K. Suddarth. 15 pp. Purdue Univ. Agric. Expt. Sta., Lafayette, Ind. 1954. Station Bul. No. 615. Mimeog.

What We Do With Pine Trees. Illus. Folder. New Zealand Forest Products, Ltd., Penrose, Auckland. 1955.

Wood Hydrolysis for Sugar Production. By R. A. Lloyd and J. F. Harris. 9 pp. U. S. Forest Products Lab., Madison, Wis. 1955. Rept. No. 2029. Mimeog.

Society Affairs

Officers and Council
1954-1955

E. L. DEMMON, *President*
Southeastern Forest Experiment Station
Federal Building
Asheville, N. C.

DEWITT NELSON, *Vice President*
Department of Natural Resources
State Building 1
Sacramento, Calif.

HENRY CLEPPER, *Executive Secretary*
Mills Building, 17th Street at Pennsylvania Avenue, N. W.
Washington 6, D. C.

WILLIAM J. BROWN
Woodlands Department
Kimberly-Clark Corporation
Neenah, Wis.

STANLEY G. FONTANNA
School of Natural Resources
University of Michigan
Ann Arbor, Mich.

JOSEPH S. ILLICK
State University of New York
College of Forestry
Syracuse 10, N. Y.

C. HUXLEY COULTER
Florida Forest Service
Tallahassee, Fla.

PERCY D. HANSON
U. S. Forest Service
Federal Building
Missoula, Mont.

J. HERBERT STONE
U. S. Forest Service
729 N.E. Oregon St.
Portland 8, Ore.

D. B. DEMERITT
Dead River Company
6 State Street
Bangor, Me.

EDWIN F. HEACOX
Weyerhaeuser Timber Company
Tacoma 1, Wash.

RUTHFORD H. WESTVELD
Department of Forestry
University of Missouri
Columbia, Mo.

Staff

ARTHUR B. MEYER
Editor of Publications

L. AUDREY WARREN
Business Manager

LLOYD THORPE
Advertising Representative

Division Officers
1955

Division of Education

Archie E. Patterson, chairman; School of Forestry, University of Georgia, Athens, Ga.

Walter F. McCulloch, vice chairman; School of Forestry, Oregon State College, Corvallis, Ore.

David M. Smith, secretary; School of Forestry, Yale University, New Haven 11, Conn.

Division of Forest Economics and Policy

Henry J. Vaux, chairman: School of Forestry, University of California, Berkeley 4, Calif.

M. B. Dickerman, vice chairman; Lake States Forest Experiment Station, University Farm, St. Paul 1, Minn.

A. C. Worrell, secretary; School of Forestry, University of Georgia, Athens, Ga.

Division of Forest Management

Myron B. Savage, chairman; Rayonier, Inc., P. O. Box 539, Hoquiam, Wash.

J. Walter Myers, Jr., vice chairman; Forest Farmers Association, Box 7171, Station C, Atlanta, Ga.

Lawrence K. Mays, secretary; U. S. Forest Service, Box 4137, Portland 8, Ore.

Division of Forest Products

Lincoln A. Mueller, chairman; Central Rocky Mountain Forest Experiment Station, Forestry Building, Fort Collins, Colo.

Russell Stadelman, vice chairman; Nickey Brothers, Inc., 2700 Summer Avenue, Memphis, Tenn.

Stephen B. Preston, secretary; School of Natural Resources, University of Michigan, Ann Arbor, Mich.

Division of Forest Recreation

William N. Parke, chairman; U. S. Forest Service, 415 Federal Office Building, Seattle 4, Wash.

Donald P. Duncan, vice chairman; School of Forestry, University Farm, St. Paul 1, Minn.

James P. Gilligan, secretary; Department of Forestry, Oklahoma A & M College, Stillwater, Okla.

Division of Forest-Wildlife Management

Ralph T. King, chairman; Roosevelt Wildlife Forest Experiment Station, Syracuse, N. Y.

Avon Denham, vice chairman; U. S. Forest Service, Box 4137, Portland 8, Ore.

C. Frank Brockman, secretary; College of Forestry, University of Washington, Seattle, Wash.

Division of Private Forestry

William D. Hagenstein, chairman; Industrial Forestry Association, 1410 S. W. Morrison Street, Portland 5, Ore.

Arthur W. Nelson, Jr., vice chairman; The Flintkote Corporation, Meridian, Miss.

Clarence Richen, secretary; Crown Zellerbach Corporation, 1400 Public Service Building, Portland 4, Ore.

Division of Public Relations

Ralph G. Unger, chairman; College of Forestry, State University of New York, Syracuse 10, N. Y.

Albert Wiesendanger, vice chairman; P. O. Box 471, Salem, Ore.

C. W. Mattison, secretary; U. S. Forest Service, Washington 25, D. C.

Division of Range Management

Charles E. Poulton, chairman; Animal Husbandry Department, Oregon State College, Corvallis, Ore.

Bert H. Tucker, vice chairman; U. S. Forest Service, Building 85, Federal Center, Denver, Colo.

Elbert H. Reid, secretary; Rocky Mountain Forest Experiment Station, 221 Forestry Building, Fort Collins, Colo.

Division of Silviculture

John W. Duffield, chairman; Forest Industries Nursery, Nisqually, Wash.

Carl Ostrom, vice chairman; Southeastern Forest Experiment Station, Federal Building, Asheville, N. C.

George R. Staebler, secretary; Pacific Northwest Forest Experiment Station, Post Office Building, Olympia, Wash.

Division of Watershed Management

A. R. Croft, chairman, U. S. Forest Service, Forest Service Building, Ogden, Utah.

E. A. Colman, vice chairman; California Forest and Range Experiment Station, Box 245, Berkeley 1, Calif.

William E. Bullard, secretary; U. S. Forest Service, 212 Pioneer Postoffice Building, Portland 4, Ore.

Society Committees and Representatives

1955

Committee for the Advancement of Forestry Education

Myron Krueger, chairman; School of Forestry, University of California, Berkeley 4, Calif.
F. H. Kaufert
C. M. Kaufman
E. R. Martell
Ernest Wohletz

Committee on Civil Service

R. J. Preston, chairman; School of Forestry, North Carolina State College, Raleigh, N. C.
M. K. Goddard
W. C. Percival
L. M. Turner
R. A. Williams

Committee on Ethics

S. G. Fontanna, chairman; School of Natural Resources, University of Michigan, Ann Arbor, Mich.
J. W. Duffield
Julius Kahn
T. J. Orr
A. E. Patterson

Editorial Committee on Forestry Handbook

Reginald D. Forbes, editor; RFD, Ambler, Pa.
E. W. Littlefield
William Maughan
James G. Osborne (Roy A. Chapman, alternate)

Committee on History of Forestry

E. N. Munns, chairman; 1639 Garnet Lane, Concord, Calif.
E. H. Frothingham
W. L. Hall
Ralph S. Hosmer
William D. Miller
Roland Rotty

Committee on International Relations

Tom Gill, chairman; 1214 16th Street, Washington, D. C.
Paul W. Bedard
I. T. Haig
V. L. Harper
LeRoy Huntington
Barrington Moore
Lyall E. Peterson
J. W. B. Sisam

Committee on Library of Congress Photograph Collection

Helmuth Bay, chairman; Rand McNally & Company, National Press Building, Washington 4, D. C.
(A committee in each Section)

Committee on Policies and Objectives

J. S. Illick, chairman; College of Forestry, State University of New York, Syracuse 10, N. Y.
P. A. Thompson
(Others to be appointed)

Committee on Safety

Seth Jackson, chairman; U. S. Forest Service, Washington 25, D. C.
E. T. Clark
Ovid Holmes
H. H. Jefferson
J. Kenneth Pearce

Committee on Section Bylaws

George R. Phillips, chairman; 4612 Harrison Street, Chevy Chase 15, Md.
Theodore H. Davis
W. Harold Horning
Bert R. Lexen
Roland Rotty

Committee on Tree Nomenclature

W. A. Dayton, consultant; U. S. Forest Service, Washington 25, D. C.

Committee on the 1955 Meeting

J. Herbert Stone, *general chairman;* U. S. Forest Service, 729 N.E. Oregon Street, Portland 8, Ore.

Program

W. F. McCulloch, chairman; School of Forestry, Oregon State College, Corvallis, Ore.
Kenneth G. Fensom
Roger Guernsey
Clare Hendee
A. J. Sandoz

Arrangements

Clarence Richen, chairman; Crown Zellerbach Corporation, 1400 Public Service Building, Portland 4, Ore.
L. G. Jolley, vice chairman
R. W. Cowlin

Collating Committee on Grade Standardization of Forest Planting Stock

J. H. Stoeckeler, chairman; Lake States Forest Experiment Station, Rhinelander, Wis.
(Members to be appointed)

Council Committee on Membership

R. H. Westveld, chairman; Department of Forestry, University of Missouri, Columbia, Mo.
C. Huxley Coulter
Edwin F. Heacox

Joint Committee on Fire Control Equipment with American Society of Mechanical Engineers

A. A. Brown, chairman; U. S. Forest Service, Washington 25, D. C.
Charles S. Cowan (W. D. Hagenstein, alternate)
W. E. McCraw
Gilbert I. Stewart

Representatives to the Logging and Sawmill Safety Code Committee, National Bureau of Standards

E. T. Clark, Pacific Northwest Loggers Association, White-Henry-Stuart Building, Seattle 1, Wash.
Seth Jackson, U. S. Forest Service, Washington 25, D. C.

Representative to the Committee on Inter-Society Relations of American Geophysical Union

Harold G. Wilm, College of Forestry, State University of New York, Syracuse 10, N. Y.

Representative to Division of Biology and Agriculture, National Research Council

Harold G. Wilm, College of Forestry, State University of New York, Syracuse 10, N. Y.

Representatives to the Council of the American Association for the Advancement of Science (Section 0), Agriculture

Robert P. Holdsworth, Forestry Department, University of Massachusetts, Amherst, Mass.
Stephen N. Wyckoff, California Forest and Range Experiment Station, P. O. Box 245, Berkeley 1, Calif.

Representative to Natural Resources Council of America

Henry Clepper

Representative to American Institute of Biological Sciences

Henry Clepper

Section Officers

(As of July 1, 1955. Dates terms began are given.)

Allegheny Section

2-55

Arthur L. Bennett, Chairman
R.D. #1, Johnsonburg, Pa.
William C. Bramble, Vice Chairman
133 East Park Avenue, State College, Pa.
William A. Parr, Secretary-Treasurer
Box 110, Bel Air, Md.
William C. Bramble, Membership Chairman
133 East Park Avenue, State College, Pa.

Chapters: 1. New Jersey
2. Philadelphia
3. West Virginia

Appalachian Section

1-21-55

Thomas Lotti, Chairman
601 Peoples Building, Charleston, S. C.
Peter Lannan, Vice Chairman
Box 531, Georgetown, S. C.
Carl H. Stoltenberg, Secretary-Treasurer
School of Forestry, Duke University, Durham, N. C.
Peter Lannan, Membership Chairman
Box 531, Georgetown, S. C.

Chapters: Winyah

Central Rocky Mountain Section

7-1-55

Carlos T. Brown, Chairman
U. S. Forest Service, Federal Center Bldg. 85, Denver, Colo.
Elmer M. Bacon, Vice Chairman
2275 Estes Street, Lakewood, Colo.
Gordon A. Ince, Secretary-Treasurer
U. S. Forest Service, Buffalo Creek, Colo.
Elmer M. Bacon, Membership Chairman
2275 Estes Street, Lakewood, Colo.

Central States Section

10-24-54

Rudolph H. Grabow, Chairman
U. S. Forest Service, Bedford, Ind.
R. W. Merz, Vice Chairman
20 Sunnyside Drive, Athens, Ohio
Charles S. Walters, Secretary-Treasurer
219 Mumford Hall, Urbana, Ill.
R. W. Merz, Membership Chairman
20 Sunnyside Drive, Athens, Ohio

Chapters: 1. Illinois Technical Forestry Association
2. Indiana
3. Ohio

Columbia River Section

7-1-55

Dan D. Robinson, Chairman
4175 Hillview Road, Corvallis, Ore.
C. Weldon Cline, Vice Chairman
18 South Groveland, Medford, Ore.
John M. Pierovich, Secretary
P.O. Box 305, Corvallis, Ore.
William J. Sauerwein, Treasurer
145 N. 16th Street, Corvallis, Ore.
Robert D. Hostetter, Membership Chairman
1420 Olive Street, Salem, Ore.

Chapters: 1. Blue Mountain
2. Central Oregon
3. Hawaii
4. Longview
5. Portland
6. Shasta-Cascade
7. Siskiyou
8. Umpqua-Coquille
9. Willamette

Gulf States Section

5-27-55

Richard M. Townsend, Chairman
Southwestern Settlement and Development Corporation, Jasper, Texas
Don B. Austin, Vice Chairman
205 East Collins, Henderson, Texas
Charles H. Sprott, Secretary-Treasurer
P. O. Box 149, Lufkin, Texas
Don B. Austin, Membership Chairman
205 East Collins, Henderson, Texas

Chapters: 1. Mississippi
2. Texas

Inland Empire Section

5-20-55

Chester D. Hole, Chairman
P. O. Box 408, % Soil Conservation Service, Lewiston, Idaho
Ernest T. Grover, Vice Chairman
410 High Street, Pullman, Wash.
Garry B. Ringold, Secretary-Treasurer
Gem Trailer Court, 505 24th North, Lewiston, Idaho
James C. Evenden, Membership Chairman
607 West Lakeshore, Coeur d'Alene, Idaho

Chapters: None

Intermountain Section

7-1-54

A. R. Croft, Chairman
2886 Van Buren Avenue, Ogden, Utah
George V. Hjort, Vice Chairman
803 N. 17th Street, Boise, Idaho
K. M. Daniels, Secretary-Treasurer
1303 5th Street, Ogden, Utah
George V. Hjort, Membership Chairman
803 N. 17th Street, Boise, Idaho

Chapters: 1. Southwestern Idaho

Kentucky-Tennessee Section

12-54

Charles R. Page, Chairman
415 Friar Road, Chattanooga 11, Tenn.
John W. Lehman, Vice Chairman
Box 88, Norris, Tenn.
Russell Stadelman, Secretary-Treasurer
Nickey Bros., Inc., 2700 Summer Avenue, Memphis 12, Tenn.
John W. Lehman, Membership Chairman
Box 88, Norris, Tenn.

Chapters: None

New England Section

3-12-54

William P. House, Chairman
Chesham, N. H.
G. S. Wheeler, Vice Chairman
U. S. Forest Service, Laconia, N. H.
E. M. Gould, Jr., Secretary-Treasurer
Harvard Forest, Petersham, Mass.
G. S. Wheeler, Membership Chairman
U. S. Forest Service, Laconia, N. H.

Chapters: 1. Granite State

New York Section

4-1-55

Allen W. Bratton, Chairman
Shelterwood, Cooperstown, N. Y.
Gerald A. Pesez, Vice Chairman
Box 500, Glens Falls, N. Y.
J. W. Barrett, Secretary-Treasurer
College of Forestry, State University of New York, Syracuse 10, N. Y.
Richard V. Lea, Membership Chairman
5559 S. Salina St., Syracuse, N. Y.

Chapters: 1. Adirondack
2. Black River Valley
3. Capital District
4. Iroquois
5. Longhouse
6. Metropolitan
7. Mid-Hudson
8. Ontario
9. Upper Hudson
10. Western New York

Northern California Section

4-1-55

K. M. MacDonald, Chairman
Woodleaf, Calif.
Donald E. Knowlton, Vice Chairman
Route 1, Box 573, Nevada City, Calif.
Richard D. Cosens, Secretary
Soper-Wheeler Co., Strawberry Valley, Calif.
Samuel H. Bryan, Treasurer
Box 298, West Point, Calif.
Earl Sechrist, Membership Chairman
Division of Forestry, State Office Bldg. #1, Sacramento 14, Calif.

Chapters: 1. Bay Area
2. Eldorado-Amador
3. Feather River
4. Lassen-Almanor Forum
5. North Coast Forest Forum
6. Redding
7. Sacramento
8. San Joaquin

Northern Rocky Mountain Section

7-1-55

Edward F. Barry, Chairman
435 Livingston, Missoula, Mont.
Ernest B. Corrick, Vice Chairman
636 South 6th St., Missoula, Mont.
Paul E. Bruns, Secretary-Treasurer
119 Mount Avenue, Missoula, Mont.

Chapters: 1. Libby

Ozark Section

7-1-55

Gordon D. Hartrick, Chairman
Fountain Hill, Ark.

John C. Burwell, Vice Chairman
Broken Bow, Okla.
Nelson F. Rogers, Secretary-Treasurer
900 East 1st, Salem, Mo.

Chapters: None

Puget Sound Section

8-9-54

Royce O. Cornelius, Chairman
Box 1645, Tacoma 1, Wash.
Laurence O. Barrett, Vice Chairman
415 Federal Office Building, Seattle 4, Wash.
Donald L. Fraser, Secretary-Treasurer
Division of Forestry, Olympia, Wash.
Philip G. Haddock, Vice Chairman for British Columbia
Faculty of Forestry, University of British Columbia, Vancouver 8, Canada
Eugene V. Zumwalt, Vice Chairman for Alaska
Bureau of Land Management, Box 120, Anchorage, Alaska
Laurence O. Barrett, Membership Chairman
415 Federal Office Building, Seattle 4, Wash.

Chapters: 1. Alaska
2. Central Washington
3. Mid-Columbia
4. North Olympic
5. North Puget Sound
6. Southwest Washington

Southeastern Section

1-55

Jack T. May, Chairman
Alabama Polytechnic Institute, Auburn, Ala.
James F. Spiers, Vice Chairman
316 Gentilly Road, Statesboro, Ga.
Lester L. Harris, Secretary-Treasurer
Box 163, Centreville, Ala.
James F. Spiers, Membership Chairman
316 Gentilly Road, Statesboro, Ga.

Chapters: 1. Alabama
2. Florida
3. Georgia

Southern California Section

7-1-55

Carl C. Wilson, Chairman
940 Ventura Street, Altadena, Calif.
Robert H. Parsons, Vice Chairman
4415 Alta Canyada Road, LaCanada, Calif.
Lynn R. Biddison, Secretary-Treasurer
940 Ventura Street, Altadena, Calif.

Chapters: None

Southwestern Section

7-1-55

Yale Weinstein, Chairman
1300 Lafayette Drive, N.E., Albuquerque, New Mexico
Harold Ratcliff, Vice Chairman
Southwestern National Monument, Globe, Ariz.
Leon O. Hill, Secretary-Treasurer
U. S. Forest Service, Santa Fe, N. Mex.
Edgar H. Palpant, Membership Chairman
Rocky Mt. Forest Experiment Station, Building T-10, Univ. of New Mexico, Albuquerque, N. Mex.

Chapters: None

Upper-Mississippi Valley Section

11-1-54

Zigmond A. Zasada, Chairman
Lake States Forest Experiment Station, Grand Rapids, Minn.
D. W. Bensend, Vice Chairman
Department of Forestry, Iowa State College, Ames, Iowa
Earl J. Adams, Secretary-Treasurer
4705 10th Avenue, South, Minneapolis, Minn.

Chapters: 1. Iowa
2. Lake Superior
3. North Dakota
4. Northwest Minnesota
5. Southern Minnesota

Washington Section

7-1-55

G. S. Kephart, Chairman
Bureau of Indian Affairs, U. S. Department of the Interior, Washington 25, D. C.
Albert W. Sump, Vice Chairman
U. S. Forest Service, Washington 25, D. C.
Gordon R. Heath, Secretary-Treasurer
U. S. Forest Service, Washington 25, D. C.

Chapters: None

Wisconsin-Michigan Section

7-1-55

Dan E. Bulfer, Chairman
123 N. Baird Avenue, Rhinelander, Wis.
T. D. Stevens, Vice Chairman
Department of Forestry, Michigan State College, East Lansing, Mich.
Paul R. Flink, Secretary-Treasurer
Forestry Division, Department of Conservation, Lansing 26, Mich.
T. D. Stevens, Membership Chairman
Department of Forestry, Michigan State College, East Lansing, Mich.

Chapters: 1. Hiawatha
2. Lower Michigan
3. Madison
4. Milwaukee
5. Northeastern Wisconsin

S.A.F. Members Invited to Pacific Logging Congress

All members attending the Society's annual meeting in Portland, Ore., October 16-19, are invited to attend also the Pacific Logging Congress to be held in Victoria, B. C., October 12, 13, and 14.

The theme of the sessions is "Logging for Maximum Utilization." Operators from all over the West Coast states and provinces will discuss this important phase of forest management.

Any Society member planning to attend the Congress should request his hotel reservation through Carwin A. Woolley, secretary, Pacific Logging Congress, 1222 American Bank Building, Portland 5, Ore. It will not be possible to obtain hotel reservations in Victoria otherwise.

Mr. Woolley will gladly provide additional information about the program and transportation facilities.

Annual Meeting

Society of American Foresters

Portland, Ore., October 16-19, 1955

Theme: "Converting the Old Growth Forest"

Schedule of Events

Members, their ladies, and guests who plan to attend the meeting are urgently requested to arrive in Portland on Sunday, October 16, or not later than the morning of Monday, October 17. The opening general session starts on Monday morning.

As will be seen from the following schedule of events, numerous meetings and technical sessions have been arranged to provide attractions for a diversity of interests.

Sunday, October 16

S.A.F. Council meeting: morning and afternoon.

Committee on Advancement of Forestry Education: afternoon.

Field Trip to Portland City Forest and Gallery of Trees: afternoon.

Editorial Board, JOURNAL OF FORESTRY: evening.

Joint meeting of Council and Section delegates: evening.

Association of Consulting Foresters: evening.

Monday, October 17

Opening General Session: morning.

Society Affairs Session: afternoon.

Ladies Field Trip to Mt. Hood: morning and afternoon.

Division of Education: evening.

Division of Private Forestry: evening.

Division of Range Management: evening.

Tuesday, October 18

Division of Silviculture: morning and afternoon.

Division of Forest Recreation: morning.

Division of Public Relations: morning.

Ladies Style Show and Luncheon: morning.

Division of Forest Products: afternoon.

Division of Forest-Wildlife Management: afternoon.

Social evening with Columbia River Section and Puget Sound Section as hosts.

HENRY SCHMITZ, president of the University of Washington, who will serve as chairman of the opening general session on Monday morning, October 17.

Wednesday, October 19

Division of Forest Management: morning and afternoon.

Division of Forest Economics and Policy: morning.

Ladies Forestry Forum: morning.

Division of Watershed Management: afternoon.

The annual Society Dinner: evening.

Thursday, October 20

Industrial Tree Farm Field Trip: all day.

Tillamook Burn Field Trip: all day.

Friday, October 21

Mt. Hood National Forest Field Trip: all day.

Forest Industries Field Trip: all day.

General Meeting

Monday, October 17

Henry Schmitz, Chairman

Morning Session

Theme: "Converting the Old Growth Forest."

1. Introduction by Chairman Schmitz.

2. Welcome by Governor Paul Patterson of Oregon.

3. "Preserving the Public's Interest in Converting the Old Forest to New." Arthur W. Greeley, U. S. Forest Service, Juneau, Alaska.

4. "Managing the Forest in the Conversion Process, with Particular Reference to Road Development." E. P. Stamm, Crown Zellerbach Corporation, Portland, Ore.

5. "Protecting the Resource in Converting the Old Forest to New." DeWitt Nelson, Department of Natural Resources, Sacramento, Calif.

Society Affairs

Monday, October 17

E. L. Demmon, President

DeWitt Nelson, Vice President

Afternoon Session

1. "The Timber Resource Review." Richard E. McArdle, U. S. Forest Service, Washington, D. C.

2. Report of the President, E. L. Demmon.

3. Report of the Executive Secretary, Henry Clepper.

4. Report of the Editor, Arthur B. Meyer.

5. Committee Reports.

Open forum discussion.

Division of Education

Monday, October 17

Archie E. Patterson, Chairman

W. F. McCulloch, Vice Chairman

David M. Smith, Secretary

Evening Session

1. "A Program of Summer Employment for Pre-forestry High School Graduates." Walter H. Schaeffer, College of Forestry, University of Washington, Seattle, Wash.

2. "Earned Doctor Degrees in Forestry." Joseph S. Illick, College of Forestry, State University of New York, Syracuse, N. Y.

3. "Limiting Enrollments in the Schools of Forestry." Glen R. Durrell, Department of Forestry, Oklahoma A & M College, Stillwater, Okla.

4. "Handling Large Enrollments Without Lowering Standards of Instruction." James D. Snodgrass, School of Forestry, Oregon State College, Corvallis, Ore.

Discussion.

5. "The Case for the Generalized Curriculum in Forestry." George B. Hartman, Department of Forestry, Iowa State College, Ames, Iowa.

6. "The Case for the Regionalized Curriculum in Forestry." Gordon D.

Marckworth, College of Forestry, University of Washington, Seattle, Wash.
Discussion.

Division of Range Management

Monday, October 17

Charles E. Poulton, Chairman
Bert H. Tucker, Vice Chairman
Elbert H. Reid, Secretary

Evening Session

Panel Discussion: "Site Classification as We Convert Old Forest Ranges to New."

1. Remarks by Division chairman.
2. "Principles in the Use of Vegetation to Indicate Grazing Potentials of Forest Land." Rexford Daubenmire, Department of Botany, State College of Washington, Pullman, Wash.
3. "Soil-Vegetation Surveys as an Aid in Range Management." Robert A. Gardner, California Forest and Range Experiment Station, Berkeley, Calif.
4. "Site Classification as a Basis for Game Range Management." Fred W. Johnson, U. S. Forest Service, Missoula, Mont.
5. "Site Classification as a Basis for the Improved Design and Interpretation of Research." David F. Costello, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.
6. "Range Management on a Scientific Basis as We Convert from Old Ranges to New." Gerald D. Pickford, U. S. Forest Service, Steamboat Springs, Colo.

Division of Private Forestry

Monday, October 17

W. D. Hagenstein, Chairman
Arthur W. Nelson, Jr., Vice Chairman
Clarence Richen, Secretary

Evening Session

1. "Are We Making Progress Fast Enough?"
2. "Private Forestry Employment."
3. "Should the Division of Private Forestry be Continued?"

Division of Silviculture

Tuesday, October 18

John W. Duffield, Chairman
Carl Ostrom, Vice Chairman
George R. Staebler, Secretary

Morning Session

1. "Forest Succession Following Fires in the Interior of Alaska." Harold J. Lutz, School of Forestry, Yale University, New Haven, Conn.
2. "Replacing the Slow-growing Climax Forests of Southeast Alaska with Second-growth." H. E. Andersen, Alaska Forest Research Center, Juneau, Alaska.
3. "Silvical Factors Influencing Resistance of Ponderosa Pine to Bark Beetle Attack." E. W. Mogren, School of Forestry and Range Management, Colorado A & M College, Fort Collins, Colo.
4. "The Silvicultural Importance of the Sitka Spruce Weevil in Coastal Oregon and Washington." K. H. Wright, Pacific Northwest Forest and Range Experiment Station, Portland, Ore., and Donald Baisinger, Crown Zellerbach Corporation, Portland, Ore.
5. "Effect of Ripeness on the Viability of Sugar, Jeffrey, and Ponderosa Pine Seeds." Gilbert H. Schubert, California Forest and Range Experiment Station, Berkeley, Calif.
6. "Where Are We in Natural Regeneration Research in the Douglas-fir Region?" Leo A. Isaac, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

Afternoon Session

Panel Discussion: "Forest Soils."
Moderator: Stanley P. Gessel.

1. "Forest Soils of the Pacific Northwest." Robert F. Tarrant, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.
2. "Effect of Tractor Logging on Soils and Regeneration in the Douglas-fir Region of Southwest Washington." Eugene C. Steinbrenner, Weyerhaeuser Timber Company, Centralia, Wash., and Stanley P. Gessel, College of Forestry, University of Washington, Seattle, Wash.
3. "Soils in Relation to Site Index Curves." Stephen H. Spurr, School of Natural Resources, University of Michigan, Ann Arbor, Mich.
4. "Forest Tree Nutrition and Forest Fertilization." T. N. Stoate, MacMillan & Bloedel, Ltd., Nanaimo, B. C., Canada, and Richard B. Walker, Department of Botany, University of Washington, Seattle, Wash.
5. "Soils Information for the Use of the Practicing Forester." Warren Starr, Department of Soils, Washington State College, Pullman, Wash.

Discussion.

6. Business meeting.

Division of Public Relations

Tuesday, October 18

Ralph G. Unger, Chairman
A. K. Wiesendanger, Vice Chairman
C. W. Mattison, Secretary

Morning Session

Panel Discussion: "Public Aspects of Old-Growth Cutting on Multiple Uses of a Forest Community."

1. "Park Preservation." Richard M. Leonard, Sierra Club, San Francisco, Calif., and Mrs. T. Wetherford, General Federation of Women's Clubs, Arlington, Ore.
2. "Roadside and Scenic Strip Preservation." Kenneth A. Reid, Whitney Industries, Inc., Sabattis, N. Y.
3. Summary. Marshall T. Dana, U. S. National Bank, Portland, Ore.

Division of Forest Recreation

Tuesday, October 18

William N. Parke, Chairman
Donald P. Duncan, Vice Chairman
James P. Gilligan, Secretary

Morning Session

1. "Conversion of the Virgin Forests in Parks." Newton B. Drury, Department of Natural Resources, Sacramento, Calif.
2. "The Value of Forest Recreation at the State Level." John Vanderzicht, Washington State Parks and Recreation Commission, Seattle, Wash.
3. "Searching for the End of the Rainbow." G. E. Cannon, Standard Insurance Company, Portland, Ore.
4. "Managing Timber Stands for Recreation." John Sieker, U. S. Forest Service, Washington, D. C.

Division of Forest Products

Tuesday, October 18

Lincoln A. Mueller, Chairman
Russell Stadelman, Vice Chairman
Stephen B. Preston, Secretary

Afternoon Session

Panel Discussion: "Utilization of Wood Residue for Hardboard."

1. Coreboard and Pulp." Ralph Chapman, Corvallis, Ore.
2. "Improving Veneer, Plywood, and Lumber with Paper Overlays." Robert Seidl, U. S. Forest Products Laboratory, Madison, Wis.
3. "Wyssen Skyline Logging." E. E. Matson, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.
4. "Growth and Use of Laminated Wood Structure." Ward Mayer, Timber Structures, Inc., Portland, Ore.
5. "Pulping Hardwoods."

Division of Forest-Wildlife Management

Tuesday, October 18

Ralph T. King, Chairman
Avon Denham, Vice Chairman
C. Frank Brockman, Secretary

Afternoon Session

Panel Discussion: "The Effect of Logging Old-Growth Timber on Wildlife." Discussion Leader: Frank R. Butler, British Columbia Game Commission, Vancouver, B. C., Canada.

1. "The Effects of Logging Old-Growth Timber on Fish Management." Philip W. Schneider, Oregon State Game Commission, Salem, Ore.

2. "The Effects of Logging Old-Growth Timber on Big Game." Eric Huestis, Department of Lands and Forests, Edmonton, Alta., Canada.

3. "The Effects of Logging Old-Growth Timber on Rodent Control." Donald Spencer, U. S. Fish and Wildlife Service, Denver, Colo.

4. "The Effects of Logging Old-Growth Timber on Bear." J. Burton Lauckhart, Washington State Game Department, Seattle, Wash.

5. "The Effects of Wildlife on Timber Reproduction Following Logging of Old-Growth Timber." Casey E. Westell, Jr., American Box Board Company, Filer City, Mich.

6. "The Effects of Logging Old-Growth Timber on Sportsman-Landowner Relationships." Kramer Adams, Weyerhaeuser Timber Company, Tacoma, Wash.

Discussion.

Division of Forest Management

Wednesday, October 19

Myron B. Savage, Chairman
J. Walter Myers, Vice Chairman
Laurence K. Mays, Secretary

Morning Session
Management

1. "Is Forest Management a Part of Forest Economics — Or What Is It?" Kenneth P. Davis, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

2. "The Practical Use of Management Plans in Initiating Sustained Yield Forestry." Wally G. Hughes, British Columbia Forest Service, Victoria, B. C., Canada.

3. "Converting Our Old-Growth Forests." Royce Cornelius, Weyerhaeuser Timber Company, Tacoma, Wash.

Discussion.

4. "Business Implications of Automation and the Need for Forest Management." James G. Rowbury, Scott Paper Company, Everett, Wash.

5. "Some Uses of Aerial Photos in the Management of Wild Land Areas." Robert N. Colwell, University of California, Berkeley, Calif.

Mensuration and Inventory

1. "Growth Inventory: A Valuable Part of Complete Forest Inventory." Earle R. Wilcox, Klamath Indian Agency, Ore.

2. "A Forest Growth Study." Paul Casamajor, Broadview Research and Development, Burlingame, Calif.

Discussion.

Afternoon Session
Forest Protection

Fire

1. "Old-Growth Conversion Also Converts Fireclimate." Clive M. Countryman, California Forest and Range Experiment Station, Berkeley, Calif.

2. "Protection of Old-Growth Douglas-fir Forests from Fire." Fred J. Sandoz, The Booth-Kelly Lumber Company, Springfield, Ore.

3. "Fire Control on Public Domain Lands in Alaska." Eugene V. Zumwalt, Bureau of Land Management, Anchorage, Alaska.

4. "Synopsis of Salvage Operations—Forks Fire of 1951." Mason B. Bruce, Olympic National Forest, Olympia, Wash.

Discussion.

Insects and Disease

1. "Cooperation Speeds Salvage of Windthrown and Beetle-Killed Timber in Oregon and Washington." W. D. Hagenstein, Industrial Forestry Association, Portland, Ore., and R. L. Furniss, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

2. "Color Photographs Useful in Evaluating Mortality of Douglas-fir." J. F. Wear, Pacific Northwest Forest and Range Experiment, Portland, Ore.

3. "Effects of Black-Headed Budworm Feeding on Second-Growth Western Hemlock and Sitka Spruce." William McCambridge, U. S. Forest Service, Juneau, Alaska.

4. Business Meeting.

Division of Forest Economics and Policy

Wednesday, October 19

Henry J. Vaux, Chairman
M. B. Dickerman, Vice Chairman
A. C. Worrell, Secretary

Morning Session

1. "Forest Resources in the Pacific Coast Economy." H. R. Josephson, U. S. Forest Service, Washington, D. C.

2. "Economic Effects of Integrated Utilization on Pacific Coast Forest Management."

a. "Recent Developments and Current Effects." Charles E. Young, Weyerhaeuser Timber Company, Tacoma, Wash.

b. "Integrated Utilization in British Columbia." Thomas G. Wright, Canadian Forest Products, Ltd., Vancouver, B. C., Canada.

c. "Implications for Future Development." John A. Zivnuska, School of Forestry, University of California, Berkeley, Calif.

3. "The Role of Public Forests in Economic Development of the Pacific Coast Region." G. Burton Wood, Department of Agricultural Economics, Oregon State College, Corvallis, Ore.

Comments. Edward P. Cliff, U. S. Forest Service, Washington, D. C. and Loran L. Stewart, Bohemia Lumber Company, Cottage Grove, Ore.

4. Business Meeting.

Division of Watershed Management

Wednesday, October 19

A. R. Croft, Chairman
E. A. Colman, Vice Chairman
W. E. Bullard, Secretary

Afternoon Session

1. Business Meeting.

2. "A Watershed Research Program for the Northwest." E. G. Dunford, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

3. "Measurement and Management of Watershed Snow Packs." R. A. Work, Soil Conservation Service, Portland, Ore.

Discussion.

4. "Water Quality and Forest Management." C. M. Everts, Jr., Oregon State Board of Health, Portland, Ore.

Discussion.

5. Panel Discussion: "Minimizing Watershed Disturbance from Logging Operations."

Moderator: D. R. Gibney.

Participants: D. E. Colwell, Cascade Lumber Company, Yakima, Wash.

Lester Moncrief, U. S. Forest Service, Ogden, Utah.

P. E. Packer, Intermountain Forest and Range Experiment Station, Missoula, Mont.

D. R. Hopkins, State Division of Forestry, Olympia, Wash.

E. A. Johnson, Coweeta Hydrologic Laboratory, Dillard, Ga.

Discussion.

Social Evening

Tuesday, October 18

The Columbia River and Puget Sound Sections have arranged a fruits-of-the-land barbecue in Oaks Park at

6 p.m. Featured on the menu will be chinook salmon, buffalo, Tillamook cheese, and other delicacies of the Northwest.

The cost per person will be $1. Transportation will be provided.

Society Dinner

Wednesday, October 19

Robert W. Cowlin, Toastmaster

Address. Bernard L. Orell, Weyerhaeuser Sales Company, St. Paul, Minn.

Entertainment.

A social hour, to which members, their ladies, and guests are cordially invited, will precede the dinner through the courtesy of the equipment companies.

Field Trips

Five field trips have been arranged to show the highlights of city, state, federal, and industrial forest management in the Pacific Northwest.

Those attending the meeting are requested to make tentative, advanced reservations for these trips, especially for the trip on Sunday afternoon, October 16. The hotel reservation form on page 600 may be used.

Tickets for each trip will be put on sale during the meeting. The indicated cost for each trip is approximate.

Ladies are welcome on all field trips except the tour to the Tillamook Burn on Thursday, October 21.

Sunday, October 16

Portland City Forest.—This is a 5,200-acre forest within the City of Portland under the management of a resident forester. The trip will include visits to Hoyt Arboretum; panoramic views of the city and of Mt. Hood; and the Gallery of Trees housed in Portland's famous Forestry Building which contains remarkable historical exhibits of forestry and logging. A reception will be held in the Gallery of Trees from 2 p.m. to 5 p.m. Complimentary refreshments will be served.

Cost of the tour, $1. Ladies are invited.

Thursday, October 20

Industrial Tree Farm Tour.—Tree Farms in the Columbia River area between Portland and Astoria will be visited, and particularly the Columbia and Clatsop Tree Farms of the Crown Zellerbach Corporation. There will be an opportunity to see thinning operations of young Douglas-fir stands and logging methods. Logging of old-growth hemlock-spruce forests along the Pacific Ocean will show the modern, highly flexible logging equipment now commonly used in the Pacific Northwest. Plantations, fire protection measures, woods utilization, and growth of young stands will be seen.

Time: 8:30 a.m. to 8:30 p.m. Cost per person, $3 (including luncheon and dinner). Ladies are invited. Clothing should include rainwear, heavy shoes, and warm jackets.

Tillamook Burn Tour.—This tour will show work by the Oregon State Forestry Department to rehabilitate state-owned lands in the Tillamook Burn—an area of about 300,000 acres in Northwest Oregon that was burned three successive times by the disastrous fires of 1933, 1939, and 1945. This is probably the world's largest forest rehabilitation project. The Burn is being fireproofed by salvage logging, snag falling, and road building; reforestation is by planting and aerial seeding.

Time: 8:30 a.m. to 5:30 p.m. Cost per person, $2.75 (including luncheon). Open to men only. Clothing should include rainwear, heavy shoes, and warm jackets.

Friday, October 21

Mt. Hood National Forest Tour.—The Mt. Hood National Forest is close to the metropolitan Portland area. It contains 1,108,998 acres. The tour will visit the Clackamas Working Circle where modern forest practices and logging methods used in the Pacific Northwest can be seen. Timber sale procedures, access road development, and forest management policies of the U. S. Forest Service which are typical of problems on federal lands in the West will be viewed.

Time: 8:30 a.m. to 5 p.m. Cost per person, $3.50 (including luncheon). Ladies are invited. Clothing should include rainwear, heavy shoes, and warm jackets.

Forest Industries Tour.—This tour will visit the forest industries of Longview, Wash., the most integrated forest utilization center of the world. Here will be seen veneer and plywood manufacture, sawmilling, pulp and paper production, bark utilization, shingle and shakes manufacture, and pole and piling yards. Plants of the Weyerhaeuser Timber Company, Long-Bell Lumber Company, and Longview Fibre Company will be visited.

Time: 8:30 a.m. to 5:30 p.m. Cost per person, $2.25 (including luncheon). Ladies are invited. Clothing should be suitable to a mill tour. Raincoats should be taken.

Ladies Activities

On Sunday afternoon, October 16, there will be a tea in the Gallery of Trees, Portland's Forestry Building.

On Monday, October 17, a field trip has been scheduled to scenic Mt. Hood with luncheon at Timberline Lodge. Transportation will be by bus.

On Tuesday, October 18, a special style show will be held in connection with brunch. In the evening the ladies are invited to the barbecue in Oaks Park.

On Wednesday, October 19, at 10 a.m. there will be held a ladies' forestry forum, directed by Dean W. F. McCulloch of Oregon State College. In the evening will be held the Society's annual dinner, preceded by a social hour, in the Multnomah Hotel.

On Thursday, October 20, ladies are welcome to take the Industrial Tree Farm Tour, described under Field Trips.

On Friday, October 21, ladies are welcome to go on either the Mt. Hood National Forest Tour or the Forest Industries Tour, described under Field Trips.

Hotel Reservations

It is suggested that those expecting to attend the meeting arrive in Portland on Sunday, October 16, or not later than the morning of Monday, October 17. The open meetings start on Monday morning.

The Multnomah Hotel will be the headquarters hotel where most scheduled events will be held. Although the Multnomah contains 600 rooms, it will not be able to accommodate all those in attendance, hence other hotels are cooperating.

A special S.A.F. Housing Committee has been set up for the meeting, and all requests for room reservations should be addressed to this committee, as follows:

Housing Committee, Society of American Foresters; c/o Portland Chamber of Commerce; 824 S. W. Fifth Avenue; Portland 4, Oregon.

The reservation coupon printed herewith may be used. Subscribers who do not wish to cut the coupon from their JOURNALS may request reservations simply by providing the Housing Committee with all the information requested on the coupon.

Each reservation request should in-

dicate first choice, second choice, and third choice hotels. As usual, single rooms may be scarce, hence when possible twin-bed rooms should be used.

There follows a list of cooperating hotels and their rates. All quoted rates are with bath unless otherwise noted. Some hotels have rooms with connecting baths at lower rates.

Hotels

Multnomah Hotel, S.W. Fourth Avenue and Pine Street. Single rooms, $6 to $8; double, $8 to $13; twin beds, $9 to $13. Sets of twin-bed rooms and double rooms connecting, for four people, $15 to $16. Suites available.

Benson Hotel, S. W. Broadway at Oak Street. (Four blocks from the Multnomah.) Single, $6 to $10; double, $8 to $15; twin beds, $11.50 to $15.

Imperial Hotel, S. W. Broadway at Stark Street. (Five blocks from the Multnomah.) Single, $4 to $6; double, $6 to $8; twin beds, $7 to $9.

Congress Hotel, S. W. Sixth Avenue and Main Street. (Ten blocks from the Multnomah.) Single, $5.50 to $7; double, $6 to $8; twin beds, $7.50 to $8.50.

New Heathman Hotel, 712 S. W. Salmon Street. (Eleven blocks from the Multnomah.) Single, $6.50; double, $8; twin beds, $8.50.

In addition to the foregoing hotels, there are other smaller hotels within the downtown area. The Housing Committee will supply a list of these hotels with their addresses for those who request it.

Motels and motor courts are available outside the downtown area. Their rates for single rooms with bath are from $5.50 up; doubles are $6.50 and up. The Housing Committee will make motel reservations, or will furnish members with a list of motels for those who may wish to request their own reservations.

Meeting Committees

The general chairman for the meeting is J. Herbert Stone, U. S. Forest Service, 729 N. E. Oregon Street, Portland 8, Ore.

Assisting him are the following committees and their personnel.

Program Committee

The chairman of the Program Committee is W. F. McCulloch, School of Forestry, Oregon State College, Corvallis, Ore. The other members are K. G. Fensom, Roger Guernsey, Clare Hendee, and A. J. Sandoz.

Arrangements Committee

The chairman of the Committee on Arrangements is Clarence Richen, Crown Zellerbach Corp., 1400 Public Service Building, Portland, Ore.

Assisting him is Laurence C. Jolley, U. S. Forest Service, 729 N. E. Oregon Street, Portland 8, Ore.

Heading up special task committees are the following individuals:

Information and Publicity, Albert Arnst.

Hotel Reservations and Housing, Howard Roberts.

SOCIETY OF AMERICAN FORESTERS

ANNUAL MEETING

Portland, Oregon. October 16-19, 1955

_____, 1955

Housing Committee, Society of American Foresters,
c/o Portland Chamber of Commerce,
824 S. W. Fifth Avenue,
Portland 4, Oregon.

First Choice Hotel _____
Second Choice Hotel _____
Third Choice Hotel _____

Please make a reservation for the following room accommodations for arrival on October _____, a.m. / p.m. Departure date, October _____.

I understand that accommodations will be provided at the daily rate specified, if available; otherwise the next nearest rate will apply.

_____ Single room with bath. Rate, $_____.
_____ Double-bed room with bath. Rate, $_____.
_____ Twin-bed room with bath. Rate, $_____.
_____ Suite (parlor, twin-bed room, and bath). Rate, $_____.
_____ Other. (Specify accommodations desired.) _____
_____. Rate, $_____.

The above room accommodations are requested for the following persons, in addition to myself. (Print or typewrite names and addresses legibly.)

_____
_____
_____

My name: _____
Street address: _____
City, zone, state: _____

PRELIMINARY FIELD TRIP RESERVATIONS

Please make the following reservations for field trips. (Tickets to be purchased at the meeting.)

	Number of persons
Sunday, October 16; afternoon	
Portland City Forest	_____
Thursday, October 20; all day	
Industrial Tree Farms	_____
Tillamook Burn	_____
Friday, October 21; all day	
Mt. Hood National Forest	_____
Forest Industries of Longview	_____

FROM EVERY ANGLE

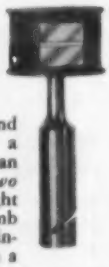
Traditional K&E care and precision go into the making of these useful forestry instruments. They are *rugged* . . . designed to stand up without the need of constant adjusting even under the rough usage of forest work.

THE RIGHT ANGLE PRISM

This compact instrument consists of a single ground triangular prism and it, therefore, cannot get out of adjustment. A plumb bob can be attached to the hook of the handle.

THE RIGHT ANGLE MIRROR

This instrument gives a slightly larger field of view and is adjustable. As an added feature, a small plumb bob is conveniently stowed in the handle.



THE DOUBLE RIGHT ANGLE PRISM

Consisting of two ground pentaprisms separated by a plano-parallel element, it can be *placed on a line between two points* and a third point at right angles can be sighted. A plumb bob can be attached or the instrument can be mounted on a staff.

THE HAND LEVEL WITH A RIGHT ANGLE FEATURE

Here is a dual-purpose instrument with all of K&E's famed precision. While its principal use is as a hand level, it offers the right angle feature as well. Note the flat base permitting use on a level board.

Ask any K&E Distributor or Branch for further information or write Keuffel & Esser Co., Hoboken, N. J.

KEUFFEL & ESSER CO.
EST. 1867
Drafting, Reproduction, Surveying Equipment and Materials, Slide Rules, Measuring Tapes.
New York • Hoboken, N. J.
Detroit • Chicago • St. Louis
Dallas • San Francisco
Los Angeles • Seattle • Montreal

Registration and Welcome, Martin L. Syverson.

Exhibits, Arthur K. Roberts.

Field Trips, Nels Jeffers.

Ladies Entertainment, Mrs. Robert Conklin.

Meeting and Conference Rooms, Owen Cramer.

Annual Dinner Arrangements, Paul Vance.

Projection and Amplifying Equipment, Clyde Stratton.

"Sergeant-at-Arms," Louis Alexander.

Special Assignments, Robert D. Hostetter.

❦❦❦

Participants in the program of the annual meeting have been requested to furnish manuscripts of their papers to the S.A.F. office not later than September 15 to assure inclusion in the Proceedings.

❦❦❦

Forest History Foundation, Inc.

The American Forest History Foundation, a special project of the Minnesota Historical Society since 1947, has been given new status as an independent nonprofit corporation known as the Forest History Foundation, Inc.

The newly created Foundation will carry on its work throughout the United States and Canada in cooperation with regional committees on forest history and a network of libraries, archives, historical societies, and museums. The declared purposes of the Foundation are:

1. To collect, preserve and disseminate the history of the North American forests and all forest-related activities.

2. To establish a bibliography of North American forest history.

3. To collect and preserve the records of forest-related groups, to find adequate repositories in which such records can be preserved, processed by manuscripts experts and made available to scholars.

4. To encourage and aid in the establishment of company and institutional archives where such are necessary for the preservation of forest history source materials.

5. To foster and promote research and writing on the history of North America's forests and forest industries and the evaluation of such history; to encourage the responsible use of basic source materials by scholars and to sponsor studies and documentary editing.

6. To publish books, pamphlets and monographs on forest history and to distribute same; to encourage forest-related groups to publish their own histories, and to aid such groups in finding competent scholars and writers for such purpose.

Dr. Frank H. Kaufert was elected president. Other officers elected are: vice president, Fred K. Weyerhaeuser; secretary and director of the Foundation, Elwood R. Maunder; treasurer, Clarence G. Frame.

The Foundation will set up offices in either Minneapolis or St. Paul.

Repositories are being chosen in each state and province to which will be referred all historical materials pertaining to local forest history. The purpose of the Foundation is to steer these valuable records into repositories where they may be made available to local and regional scholars. Of particular value are old pictures, diaries, journals, business records, conservation records, letter files, maps, and back files of trade and professional journals.

❦❦❦

The President's Column

E. L. DEMMON

The Forestry Handbook is now an accomplished fact and will be available for distribution September 15. I have reviewed several sections in page proof and feel confident that it will be a publication of which Society members may well be proud. It represents many hours of unpaid work of more than 200 Society members who prepared and critically reviewed the material on a committee basis.

The proposal to initiate this project was first made in 1946 by Ralph R. Hill, of the U. S. Forest Service office in Denver, Colo. A committee consisting of D. A. Anderson, S. R. Gevorkiantz, L. W. R. Jackson, D. G. McKeever, and R. R. Hill, chairman, was appointed to explore the possibility of getting out such a publication, and reported at the annual meeting in Minneapolis in December 1947 (JOUR. FORESTRY 46:201-205, March 1948).

Their report was accepted by the Council, and committees were appointed to gather material for the publication. These committees carried out their work as a labor of love, some completing their assignments more rapidly than others, and reports on progress were made to several Councils during ensuing years.

It soon became evident that an editorial committee would be needed and this was appointed in 1949 (E. W. Littlefield, chairman; Wm. Maughan; James G. Osborne, (Roy A. Chapman); and Henry Clepper, ex officio) with R. D. Forbes acting as a paid part-time technical editor. Originally 19 committees were set up to cover the various specialized forestry and related fields. Although about 100 individuals participated in the original preparation of material for the book, actually more than twice this number made or reviewed contributions, and offered comments and criticisms.

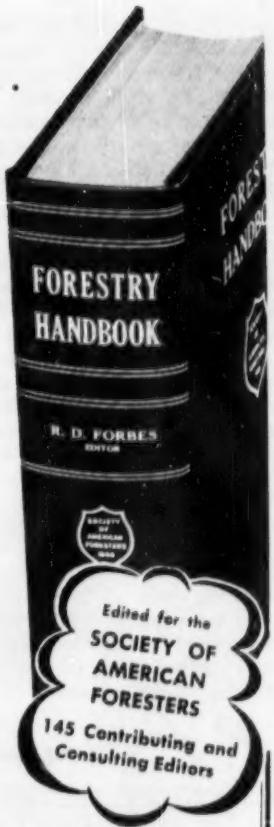
The Society made an initial appropriation of $5,000, which was subsequently increased to a total of $9,500, to cover the part-time salary of the technical editor, to pay typists when it was impossible to get the work done gratuitously, and for other minor expenses connected with the project.

Progress on the book was slow. Some of the chairmen and original committee members failed to carry through on their assignments and had to be replaced. The material came to the editor in a variety of shapes, and much revision and correspondence was necessary to ready it for publication. In November 1952 it was far enough along so that sample chapters could be submitted to several publishers, of which The Ronald Press Company of New York was finally selected in April 1954 to do the job.

Although the project for many years had been designated as a Foresters' Field Manual, it was finally decided that the manuscript encompassed much more than a manual in the ordinary sense of the word. It was therefore decided to call it a Forestry Handbook. The book consists of 23 separate chapters and 1,212 pages, and covers practically every aspect of forestry and allied fields, with numerous formulas, tables, converting factors, and other background material helpful to foresters. The retail price is $15 per copy. A special price of $12.50 per copy has been established for college purchase. Through arrangements with the publishers, the Society receives a royalty on the retail price of all copies sold. This will help reimburse the So-

Announcing — the first complete, authoritative . . .

FORESTRY HANDBOOK



All the facts, techniques, and vital data of on-the-ground forestry — at your fingertips!

Eight years in preparation, this comprehensive Handbook reflects virtually the entire literature of forestry in presenting all of the basic formulas, tables, converting factors and related data commonly used by foresters today.

Here is the only reference source to provide in quick summary form the tremendous range of information needed by everyone with a professional or commercial interest in the forest lands and crops of North America. Covering every aspect of practical forestry and its important allied fields, the Forestry Handbook organizes the efforts of over 140 specialists representing all of the major forest regions of the United States and Canada.

Edited for the SOCIETY OF AMERICAN FORESTERS
145 Contributing and Consulting Editors

★ ★ ★ *23 INFORMATION-PACKED SECTIONS*

Forest Measurements — Forest Management: Volume Tables; Yield Tables and Stocking; Cutting Budget and Annual Cut — Geology and Soils — Silvics and Silviculture — Fire Protection — Insect and Disease Protection — Forest Wildlife Management — Watershed Management — Forest Range Management — Forest Recreation — Utilization and Wood Technology — Economics and Finance — Logging — Surveying — Forest Road Engineering — Aerial Photography — Communications — Chemistry and Physics of Wood; Tables, Definitions — Etc.

REGINALD D. FORBES, Consulting Forester: Editor-in-Chief;
ARTHUR B. MEYER, Editor, Journal of Forestry: Staff Editor

Indispensable — In the Field, in the Office. The Forestry Handbook saves hours of time and work by reducing a tremendous bulk of information to workable, tabular form. Hundreds of illustrations — maps, drawings, sketches, sample reports, charts, inventory forms — help you visualize procedures, pinpoint the facts you want, minimize paperwork.

Techniques, Knowledge to Supplement Your Own Experience. The Handbook is your prime adviser in hundreds of routine and unusual situations: modern timber appraisal methods • forest taxation • timber contract provisions • improved fire fighting techniques • on-the-spot diagnosis of ailing trees or stands • calculating growth rate from stand data • erosion control • wildlife conservation • soil development—Etc.

1212 Pages 6" x 9"
744 Ills., Tables
Flexible Binding
Fully Indexed $15

MAIL COUPON TODAY!

THE RONALD PRESS COMPANY
15 East 26th Street, New York 10

Please send me at once . . . copies of the new Forestry Handbook @ $15 per copy. I understand I must be completely satisfied; otherwise I may return Handbook. *(We pay postage when check accompanies order.)*

☐ Bill me ☐ Bill organization
☐ Check enclosed

Name _____
Organization _____ JF-1
Address _____
City _____ Zone _____ State _____

ciety for the funds it has invested in the project.

This Handbook will necessarily be subject to periodic revisions, in order to keep it up to date and of greater use and value to practicing foresters. The cooperation of all members is enlisted to that end.

I commend the Handbook to all Society members as a publication useful to our profession. Of course it was meant primarily for field men, but it can serve as a very ready reference to any practicing forester. Let us take pride in this project envisioned and carried through by our Society, tangible evidence of a real professional accomplishment. I trust that all members will agree with this statement after they have had an opportunity to examine the new Handbook. Copies may be had from The Ronald Press Company, 15 East 26th Street, New York 10, N. Y. or may be ordered from any book store.

To the many Society members who had a hand in this worthwhile project for a job well done, my heartiest congratulations and commendations.

E. L. Demmon

Rootspred
Tree Planters

3 models

Standard

For heavy, stony soils, steep hillsides. Heeling wheels adjustable to line up with tree row on hillsides. Widely used by northeastern Christmas tree growers.

Lake States

Same features as "Standard" but has scalping middlebuster between coulter and trencher.

M-4

Extra heavy construction with 28" coulter. For partly cleared or cutover land. Plants on short curves where stumps, roots, brush are problems.

These are heavy-duty machines for Ford, Ferguson, Case, International Super C., etc.

Write for photos, literature

ROOTSPRED
St. Petersburg, Penna.

Last Call for Council Nominations

All voting members are hereby notified that the regular biennial election will be held December 3, 1955. A president, vice president, and nine other members of the Council will be elected for the two-year term 1956-1957.

The present Council is listed in the box on page 675. Any or all of these incumbents may be renominated, provided they accept the nomination in writing.

President Demmon has announced that he will not be a candidate for re-election.

Membership on the Council is restricted by the Constitution to Members (formerly Senior Members) and Fellows. Any Member or Fellow is eligible to hold office who is in good standing and who accepts the nomination in writing and declares his willingness to serve if elected.

Each voter will have an opportunity to ballot on all candidates for office. Council members ar elected in accordance with the system of proportional representation. The procedure of proportional representation will be explained in a later issue of the JOURNAL. It is the system by which the Society has been electing Council members for two decades.

Candidates for the office of president are voted on separately; the candidate who receives the highest vote is declared elected president, and the candidate who receives the next highest vote is declared elected vice president.

How Nominations Are Made

The Constitution (Article VIII, Section 2) states the conditions under which nominations are made by petition.

1. Each petition shall name but one candidate.

2. All candidates must be eligible to hold elective office.

3. A petition shall bear the signatures of at least ten voting members who at the time of signing the petition are eligible to vote in the coming election. (Eligible voting members are Junior Members, Members, and Fellows in good standing.)

4. A voting member may not sign more than one nominating petition for President or more than one nominating petition for a member of the Council. That is, he may sign two, but no more.

5. Petitions must be in the Society office by October 1, 1955.

The Society has no special form for submitting nominating petitions. They may be written as follows:

We, the undersigned voting members of the Society of American Foresters, hereby nominate John Doe, a Member (or Fellow), for the office of President (or member of the Council) for the two-year term 1956-1957.

All nominating petitions should be sent promptly to the Society office. The executive secretary will gladly provide information about nominating or election procedure.

Nominations Received

On the date this issue went to press the following nominations had been received.

For President

George B. Amidon, International Falls, Minn.

DeWitt Nelson, Sacramento, Calif. (Vice president, 1954-1955.)

For the Council

B. E. Allen, Savannah, Ga.
N. T. Barron, Franklin, Va.
Philip A. Briegleb, New Orleans, La.
Randolph M. Brown, St. Paul, Minn.

For rough usage, unburnable, all metal. Simple variable tine spread.

The ideal light weight hand tool for fire suppression of rakeable hand fuels. Also for leaves, forest debris or any rakeable matter.

Tine wires are of heat treated spring steel and zinc plated. Tine wires can be easily replaced.

Strong aluminum handle is corrosion proof and will not break, warp or burn.

WENZEL COMPANY
925 FOURTH ST. OSHKOSH, WIS.

C. H. Coulter, Tallahassee, Fla. (Council member, 1954-1955.)

S. G. Fontanna, Ann Arbor, Mich. (Council member, 1954-1955.)

Paul M. Garrison, Bogalousa, La.

Maurice K. Goddard, Harrisburg, Pa.

P. D. Hanson, Missoula, Mont. (Council member, 1954-1955.)

Verne L. Harper, Washington, D. C.

George B. Hartman, Ames, Iowa

Edwin F. Heacox, Tacoma, Wash. (Council member, 1954-1955.)

William P. House, Cresham, N. H.

Joseph S. Illick, Syracuse, N. Y. (Council member, 1954-1955.)

Edward N. Munns, Concord, Calif.

Harrod B. Newland, Frankfort, Ky.

Albert D. Nutting, Augusta, Me.

Richard J. Preston, Raleigh, N. C.

J. Herbert Stone, Portland, Ore. (Council member, 1954-1955.)

Henry J. Vaux, Berkeley, Calif.

The Society's Constitution provides that there shall be at least two candidates presented for the office of President, and at least nine candidates for the Council. Inasmuch as this constitutional provision has now been met, the Nominating Committee will make no nominations of its own. Additional nominations from the voting membership will continue to be received up to the the closing date, October 1.

A. R. BOND, *Chairman*
Nominating Committee

Coming Events

New England Section

The summer meeting will be held at Amherst, Mass., Sept. 7-8. Housing will be in one of the University dormitories.

American Forestry Association

The annual meeting of the American Forestry Association will be held October 3-6 at the George Washington Hotel, Jacksonville, Fla.

Central States Section Meeting

The annual meeting of the Central States Section will be held in Jasper, Indiana, October 6 and 7.

10th Lake States Logging Congress

The tenth annual Lake States Logging Congress will be held September 15-17 at Houghton and Hancock, Mich. Sponsored by The Timber Producers Association.

Association of State Foresters

The annual meeting of the Association of State Foresters will be held October 10-12, at Deadwood, South Dakota. Headquarters: Franklin Hotel.

Allegheny Section Meeting

The winter meeting of the Allegheny Section will be held February 10 and 11 at the Bellevue-Stratford Hotel, Philadelphia, Pa. John R. McGuire, 816 Cedar Avenue, Drexel Hill, Pa. is in charge of local arrangements.

when you MARK TREES The NELSON WAY!

IT'S TRUE—Using Nelson's three way time and money saver—Paint you don't have to stir—Packed in quart cans which screw directly to the NEL-SPOT gun with reversible nozzle that cleans itself—4 quarts of Nelson tree marking paint cost less than the cheapest paint you can buy by the gallon.

HERE'S WHY —

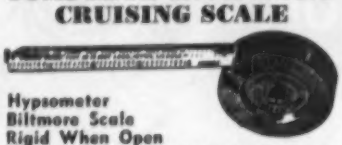
1. **YOU USE LESS PAINT**—You get many more marks per gallon of paint. Foresters report they use from 40 to 50 per cent less Nelson paint than other paints they previously used.
2. **YOU SAVE TIME WITH NELSON QUARTS**—No mixing, stirring, straining, transferring or spilling of paint. No nightly cleaning of guns and equipment. No waste time unplugging guns and trying to make cheap paints work. Foresters report saving of from 10 to 30 per cent of their work day.
3. **YOUR MARKS ENDURE**—Trees marked with Nelson tree marking paint stay marked—eliminating costly re-marking. Nelson paint stays on the surface leaving bright and durable marks which remain visible for years. Can also be used for boundaries.

Yes—IT'S TRUE that 4 Nelson quarts are more economical than the cheapest paints you can buy by the gallon. Quality in paint as in other things—not only pays for itself but saves—because—you use less and you save time, the most important factor costwise. Prove this for yourself—Send your order today or write for free bulletin and prices, Dept. JF.

THE NELSON COMPANY Iron Mountain, Mich.

Photogrammetric
STEREOSCOPES - STEREOMETERS
SKETCHERS - PLOTTERS
HARRISON C. RYKER, INC.
1209 - 8th Ave. Oakland, Calif.

EUROPEAN TREE SEEDS
Specialties: seeds for Xmas Trees and Forestry
Write for Price List
JULIUS STAINER
Kilnhouses
Wiener — Neustadt
Austria

COMPLETE INVENTORY CRUISING SCALE

Hypsometer
Biltmore Scale
Rigid When Open
Flexible 6-foot Steel Tape $3.00 EACH
Handy Chrome-plated Case 1¾" Dia.
IMMEDIATE DELIVERY
CARL W. GETZ, *President*
KURFEW, INC.
Lansdale, Pa.

METEOROLOGICAL SERVICE
Fire Danger Rating . . . Weather Modification
Forecasts and Advisories . . . Instruments
J. B. "Ben" Melin — 2806 32nd Ave., S. Seattle 44, Wash.
R. Kirkpatrick — 1805 N.E. 141st Ave. Portland 20, Ore.

THE RENOWNED
CHARLES H. RICH
"Forest Fire Fighting Tool"
Write for Prices and Descriptions
Geneva Rich Bickel WOOLRICH, PA.

TREE MARKING AXES
The modern method for marking trees. Eliminate all paint problems by blazing and stamping trees with your brand. Nothing to carry but a light 2 lb. axe. 4" cut, 27", 23" or 18" handles. Priced at $10 each with one 1½" or two ¾" hardened characters on head. Special designs quoted upon request.
A. R. SMITH 10003 S. E. ECKLER AVE. PORTLAND, ORE.

Last Call for Nominations for Grade of Fellow

All Members (formerly Senior Members) and Fellows of the Society are hereby advised that nominations for the grade of Fellow are now open. The election of Fellows will be held at the time of the Society's regular biennial election, December 3, 1955.

As defined by the Constitution (Article III, Section 6), "Fellows shall be foresters of outstanding achievement as leaders in responsible directive or distinctive individual work of a fruitful character. They shall be elected from the Members and shall be engaged in forestry work at the time of their election."

Nominations by Petition

The procedure for placing Members in nomination for the grade of Fellow is by petition. The Society has no printed form for this purpose; the petition may be typewritten thus:

We, the undersigned Members and Fellows of the Society of American Foresters, hereby nominate ———— for election to the grade of Fellow in 1955.

Remember these simple rules:

1. A petition may not name more than one candidate.

2. It must be signed by 25 Members or Fellows in good standing.

3. It should be accompanied by a factual, not eulogistic, biographical sketch of at least 200 words giving an account of the nominee's professional career and accomplishments.

4. It must be received in the executive office of the Society in Washington, D. C., not later than October 1, 1955.

The executive employees of the Society cannot be responsible for obtaining signatures on partially completed petitions or on petitions incomplete by reason of unacceptable signatures (that is, signatures of other than Members and Fellows in good standing).

Nominations Received

On the date of going to press, the following Members had been nominated for the grade of Fellow:

Reed W. Bailey, Ogden, Utah
Willis M. Baker, Hiwassee Dam, N.C.
John S. Boyce, New Haven, Conn.
Robert W. Cowlin, Portland, Ore.
Dwight B. Demeritt, Bangor, Me.
Samuel B. Detwiler, Boulder, Colo.
James F. Dubuar, Wanakena, N. Y.
Stanley G. Fontanna, Ann Arbor, Mich.
Bernard Frank, Washington, D. C.
Charles G. Geltz, Gainesville, Fla.
S. R. Gevorkiantz, St. Paul, Minn.
J. Alfred Hall, Madison, Wis.
Willard R. Hine, Atlanta, Ga.
Julius V. Hofmann, Raleigh, N. C.
Frank H. Kaufert, St. Paul, Minn.
F. Paul Keen, Berkeley, Calif.
C. Otto Lindh, Albuquerque, N. Mex.
Gordon D. Marckworth, Seattle, Wash.
Arthur C. McIntyre, Harrisburg, Pa.
Nicholas T. Mirov, Berkeley, Calif.
Clarence W. Richen, Portland, Ore.
T. Schantz-Hansen, Cloquet, Minn.
Raymond F. Taylor, Juneau, Alaska
Arthur T. Upson, Tucson, Ariz.
Philip C. Wakeley, New Orleans, La.
R. H. Westveld, Columbia, Mo.
Herman Work, Staunton, Va.

Election Procedure

Fellows are not elected by the membership at large, but by a board of electors which consists of all present Fellows and the present Council. (A Council member who is also a Fellow has but one vote.)

To win election a candidate must receive an affirmative vote of not less than one-half the total votes cast.

Significance of the Grade

The highest membership distinction that can be conferred by the Society, this grade is awarded in recognition of outstanding achievement. Fellows do not pay increased dues; their dues are the same as those of Members.

Since the Society was founded in 1900, there have been 100 Fellows elected. At the present time the number of living Fellows is 69.

See page 609 of the August issue for a current list of Fellows.

D. M. Rochester (1904-1955)

Donald Marlin Rochester died suddenly on July 1 while on a business trip for the American Paper and Pulp Association.

Born March 9, 1904 in Michigan, he was a graduate of Michigan State College where he studied forestry and agriculture. After teaching vocational agriculture in public schools of the state, he carried on educational work for the Michigan Department of Conservation, and later was a training officer for the U. S. Forest Service.

From secretary of the Forest Industries Information Committee of the American Paper and Pulp Association during 1943-1946, he became field director for American Forest Products Industries, Inc., and subsequently returned to the Association.

Activities of Northern Rocky Mountain Section

The Northern Rocky Mountain Section of the Society on July 7 installed its 1955-1956 officers at an outdoor meeting on the Lick Creek experimental area near Lake Como in the Bitterroot National Forest, Montana.

Edward F. Barry, supervisor of the Lolo National Forest, took over as chairman; Ernest B. Corrick, Land Division, Anaconda Mining Company, as vice chairman; Paul E. Bruns, consulting forester as secretary-treasurer; and Robert Milodragovich, Helena National Forest as nonresident member of the executive committee.

The field meeting demonstrated the results of a timber sale on Lick Creek made during the period 1907-1911. W. W. White, retired from the U. S. Forest Service, who was one of those in charge of the sale, explained the methods and problems of a pioneer sale. Arthur L. Roe, retiring Section chairman and leader of the Missoula Field Research Center of the Intermountain Forest and Range Experiment Station, related the history of the area from 1911-1952 when another sale was made at Lick Creek. Kenneth Boe, station silviculturist, took the group through the proposed sale area and explained the research work within it.

On June 13th the Section held a ladies night-dinner meeting at the Florence Hotel in Missoula for members and guests to meet with the officers and Council of the Society. The latter held their spring meeting at the Schafer Ranger Station of the Flathead National Forest on June 14 and 15. Over 200 members and guests heard the Council members in comments on forestry affairs in their home areas.

PAUL E. BRUNS
Secretary

Alaska Chapter Meeting

The Timber Division, Ketchikan Pulp Company, was host for the second meeting of the Alaska Chapter, Puget Sound Section. About thirty foresters boarded the Company's M/V Marlena at Ketchikan the afternoon of May 19 and proceeded to the main logging camp at Hollis, forty miles west

GENUINE SWEDISH
INCREMENT BORERS

PRECISION TOOLS FOR FORESTERS

Available in 4" 6", 8", 10", 12", 14" and 16" lengths. Also available Swedish bark - measuring instruments and Swedish steel tree calipers. Write for quotation.

SANDVIK SAW & TOOL
DIVISION OF SANDVIK STEEL, INC.
1702 NEVINS ROAD
FAIR LAWN, N. J.

I ALWAYS BUY SEAL BRAND!

SLIM or STANDARD
Pattern Axe Handles

Designed and balanced for rough, hard use. Made only from selected, second growth heavy hickory. Triple inspected. You have greater strength — less breakage with Seal Brands. Wood wedges included with each handle.

Choose from your price range

. . . Gold Seal
. . . Blue Seal
. . . Green Seal

LaPIERRE-SAWYER HANDLE CO.
JACKSON, MO.

of Ketchikan. At Hollis this group was joined by the Ketchikan Pulp Company and U. S. Forest Service foresters working in that area.

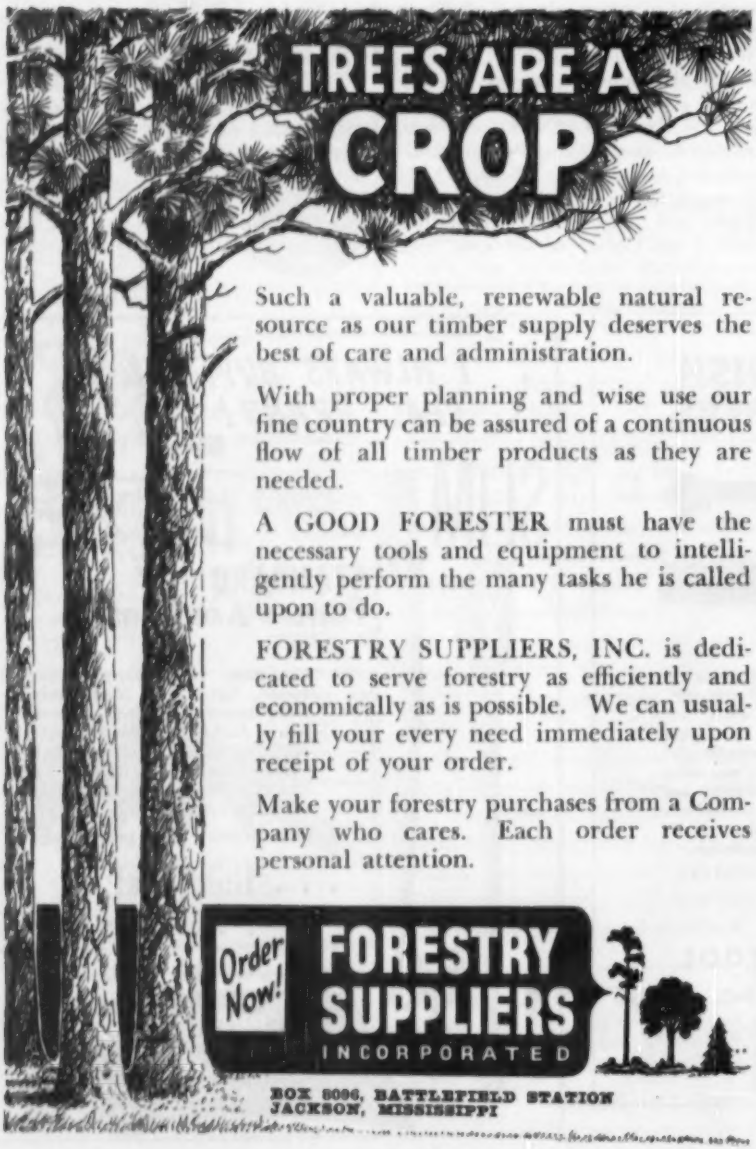
Following dinner at camp the meeting was called to order by Chairman Urban C. Nelson, U. S. Fish and Wildlife Service. After a brief business meeting a panel of Ketchikan Pulp Company personnel, consisting of A. M. Brooks, manager, Timber Division; Frank Lound, logging engineer; Earl Shipley, logging superintendent, Hollis Camp; Ted Yocom, chief forester; and Ford Knott, assistant manager, Timber Division, discussed the Company's timber operations.

Harold E. Andersen, project leader, Forest Management Research of Alaska Forest Research Center, U. S. Forest Service, outlined the forest management research program which is centered mainly at Hollis. Research began at Hollis six years before logging, affording time to obtain detailed data on the climax stands. This information will be invaluable in interpreting results following logging of research on regeneration. C. M. Archbald, division supervisor, Southern Division, Tongass National Forest, discussed the administration of the 50-year sale which is the largest single timber sale in the history of the U. S. Forest Service.

Highlight of the evening program was the talk by S.A.F. past-president George L. Drake, who was in Alaska in connection with his forest consultant work. Mr. Drake first reminisced about the "good old days" when 41 years ago he was a one-man U. S. Forest Service task force in the district forester's office at Ketchikan. He then gave an interesting account of his recent trip to Europe. All foresters present enjoyed hearing and meeting Mr. Drake.

The following day the group made a field trip visiting the logging operations and returned to Ketchikan that afternoon.

HAROLD E. ANDERSEN
Secretary-Treasurer
Alaska Chapter


TREES ARE A
CROP
Such a valuable, renewable natural resource as our timber supply deserves the best of care and administration.
With proper planning and wise use our fine country can be assured of a continuous flow of all timber products as they are needed.
A GOOD FORESTER must have the necessary tools and equipment to intelligently perform the many tasks he is called upon to do.
FORESTRY SUPPLIERS, INC. is dedicated to serve forestry as efficiently and economically as is possible. We can usually fill your every need immediately upon receipt of your order.
Make your forestry purchases from a Company who cares. Each order receives personal attention.
Order Now!
FORESTRY SUPPLIERS
INCORPORATED
BOX 8096, BATTLEFIELD STATION
JACKSON, MISSISSIPPI

S.A.F. Consulting Foresters Directory to be Published

Persons and firms listed in the S.A.F. Consulting Foresters Directory, published in the January 1955 JOURNAL OF FORESTRY, have been requested by mail to approve, correct, or revise their listings for the new directory to be published in the January 1956 JOURNAL.

Members doing consulting forestry work and whose names have not previously appeared are invited to apply now for listing. They should provide complete information following the form used in the List of Consulting Foresters published in the January 1955 JOURNAL OF FORESTRY. Society membership is a prerequisite for listing. Consulting firms will be listed if one or more of the partners or employes are members of the Society.

November 1, 1955 is the last date on which listings will be accepted for publication in the January 1956 directory.

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatements received in the Society office during the month of July are listed blow.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of October 1, 1955. Communications from voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Allegheny Section

Junior Grade

Porcella, S., 16 Holly St., Cranford, N. J.
Reinstatement.

Students Eligible for Automatic Advancement

PENNSYLVANIA STATE UNIVERSITY
McNeal, L. J.

Appalachian Section

Junior Grade

Graff, J. N., Dist. Forester, Virginia Forest Service, Tappahannock, Va. Reinstatement.
Smith, G. E., Woodland Cons., U.S.D.A., Georgetown, S. C. Reinstatement.
Tupper, M. W., Field Rep., N. C. Pulp Co., Whiteville, N. C. Reinstatement.

Member Grade

Stoltenberg, C. H., Asst. Prof., Duke Univ., Durham, N. C.; Univ. of Calif., B.S.F., 1948; M.F.; 1949; Univ. of Minn., Ph.D., 1952. (Junior, 1949).

Affiliate Grade

Stegall, W. A., Agriculturist, U.S.F.S., Asheville, N. C.

Central Rocky Mountain Section

Junior Grade

Students Eligible for Automatic Advancement
COLORADO A & M COLLEGE

Amidon, E. L.
Chapparo, W. J.
Goll, C. E.
Hanson, J. A.
Henley, J. W.
Hoefer, J. F.
Lehman, R. C.
Lund, A. E.
Mast, J. R.
Mulvaney, R. J.
Osborn, A. C.
Petersen, L. J.
Pritchard, V. E.
Taylor, W. E.
Waltz, B. L.
Wittmeyer, J. G.

Central States Section

Junior Grade

Green, A. W., Research Forester, Carbondale Research Center, Carbondale, Ill.; Purdue Univ., B.S.F., 1955.

Students Eligible for Automatic Advancement
PURDUE UNIVERSITY

Hunt, J. T.

Columbia River Section

Junior Grade

Burnett, L. A., Box 42, Cave Junction, Ore. Reinstatement.
Dubuar, C. M., Asst. Dist. Forester, Bur. of Land Mgmt., Medford, Ore. Reinstatement.
Krell, R. K., 1820 Dogwood Avenue, Reedsport, Ore. Reinstatement.
Warnke, J. C., Forester, Bur. of Land Mgmt., Medford, Ore.; Mont. State, B.S.F., 1950.

Students Eligible for Automatic Advancement
OREGON STATE COLLEGE

McDonald, T. C.
Philbrook, M. E.
Warner, J. J.

Gulf States Section

Junior Grade

Webb, W. E., Box 293, Wichita Falls, Texas. Reinstatement.
West, J. T., Dist. Forester, Masonite Corp., Leakesville, Miss.; Univ. of Fla., B.S.F., 1950.

Member Grade

Cloud, M. C., Dist. Forester, Texas Forest Service, Kirbyville, Texas; Univ. of Ga., B.S.F., 1940; M.F., 1950. (Junior, 1950).
McKillips, R. L., Box 137, Natchitoches, La. Reinstatement.

Affiliate Grade

Whitaker, L. B., Forestry Aide, U.S.F.S., Glenmore, La.

New York Section

Junior Grade

Manross, J. H., 316 Cherry St., Syracuse, N. Y. Reinstatement.

Students Eligible for Automatic Advancement
STATE UNIVERSITY OF NEW YORK

Allen, G. E.
Curran, J. R.
Smith, H. W.

Northern California Section

Junior Grade

Students Eligible for Automatic Advancement
UNIVERSITY OF CALIFORNIA

Clark, K. P.
Cox, J. E.
Haight, H. H.

Northern Rocky Mountain Section

Junior Grade

Students Eligible for Automatic Advancement
MONTANA STATE UNIVERSITY

Chamberlin, J. L.
Dahl, J. B.
Estey, W. B.
Gibson, R. S.
Gilliam, J. J.
Hanson, H. E.
Hautzinger, J. L.
Holden, J. D.
Jasnkowski, R. T.
Kelley, A. F.
Larkin, D. H.
Moore, H. R.
Poulson, W. L.
Rogers, B. L.
Smith, Z. G.
Swensen, A. D.
Wanner, K. A.
Williams, D. V.

Ozark Section

Junior Grade

Freeman, E. A., Head Forester, Frost, Olin Mathieson Chemical Corp., Huttig, Ark. Reinstatement.
Musgrove, J. G., Field Asst., International Paper Co., Malvern, Ark.; Stephen F. Austin State College, B.S., (Forestry), 1951. (Affiliate, 1952).
Nash, A. J., Asst. Prof., Dept. of Forestry, Univ. of Mo., Columbia, Mo.; Univ. of B. C., B.S., (Forestry), 1946; State Univ. of N. Y., M.F., 1952.

Puget Sound Section

Student Grade
UNIVERSITY OF WASHINGTON

Harding, R. A.

Junior Grade

Van Sickle, F. S., Forester, U. S. Indian Service, Harrah, Wash. Reinstatement.

Students Eligible for Automatic Advancement
UNIVERSITY OF WASHINGTON

Beauchamp, V. H.
Berg, C. B.
Cole, D. W.
Johnstone, H. W.
Junk, R. W.
Millo, C. E.
Myers, J. L.
Nord, F. F.
Nunan, A.
Pardo, R. D.
Pedersen, J. M.
Petrone, E. A.
Shirley, G. F.
Smith, E. E.
Stephens, F. R.
Walton, P. T.
Willrich, C. A.
Witter, R. N.

Southern California Section

Junior Grade

Waddell, T. J., Asst. State Forest Ranger, Calif. Div. of Forestry, Paso Robles, Calif.; Wash. State, B.S., (Forest Mgmt.), 1950. Affiliate, 1952).

Southeastern Section

Student Grade
UNIVERSITY OF GEORGIA

McDonald, J. A.
Reid, T. M.

Junior Grade

Bauerband, R. L., Mgmt. Forester, Ga. Forestry Comm., Milledgeville, Ga. Reinstatement.
Davis, B. M., Dist. Supt., International Paper Co., York, Ala.; A.P.I., B.S., (Agric. Engr.), 1943. (Affiliate, 1952).
Harper, R. W., 185 Fortson Drive, Athens, Ga. Reinstatement.
Lawrence, P. L., Asst. to Chief Forester, Interstate Land & Improvement Co., Macon, Ga.; Univ. of Ga., B.S.F., 1949.
McKee, J. R., Forestry Supv., St. Regis Paper Co., Cantonment, Fla. (Affiliate, 1951).
Moorman, M. L., Field Asst., International Paper Co., Homerville, Ga.; Univ. of Fla., B.S.F., 1950.

Upper-Mississippi Valley Section

Junior Grade

Students Eligible for Automatic Advancement
IOWA STATE COLLEGE

Combs, M. H.
Hunter, C. R.
Watts, R. H.

Wisconsin-Michigan Section

Junior Grade

Students Eligible for Automatic Advancement
UNIVERSITY OF MICHIGAN

Sucoff, E. I.

Foreign

Corresponding Member

Becking, R., Nachtegaalaan 17, Valkensevaard, N.B., Netherlands; Univ. of Wash., Ph.D., (Silviculture), 1955.
Von Deichmann, V., Bad Godesberg, Koblenzerstr. 97, Germany; Mont. State, M.F., 1955.

FORESTRY and RELATED RESEARCH in NORTH AMERICA

Prepared by Frank H. Kaufert, Project Director, and William H. Cummings, Project Forester, for the Society of American Foresters Forestry Research Project.

Financed by a grant from the Rockefeller Foundation, the study was made under the general supervision of a steering committee of the Society of American Foresters and the National Research Council. *Forestry and Related Research in North America* is the result of a reappraisal of the existing structure of forestry and related research programs in North America, and includes recommendations and goals for the next quarter-century.

271 pages, including 15 individual subject matter sections.

Price per copy $5, postpaid

$3 only to members of the Society of American Foresters

Send Check with order to

SOCIETY OF AMERICAN FORESTERS

Mills Building Washington 6, D. C.

When writing the advertisers mention the JOURNAL OF FORESTRY

BAKED ENAMEL

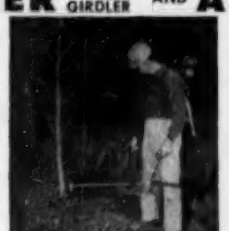
METAL FORESTRY SIGNS

for WOODLAND BOUNDARY MARKERS — NO TRESPASSING & FIRE WARNING SIGNS — CRUISER TAGS, etc., etc., made to your specifications. Write for quotations on all your sign needs.

A. L. LIND COMPANY
5030 Thomas Ave. So.
Minneapolis 10, Minnesota

LITTLE BEAVER TREE GIRDLER AND ATTACHMENTS

Little Beaver Tree Girdler, cuts girdle around tree at walking speed. One man will girdle more acres per day than several men using other methods.



Brush and Pruning Saw attachments to take care of any brush cutting or pruning job. four foot sections may be added to get desired height. Brush saw does the work of several men.

A Post Hole Auger designed for one man operation, doing the work of heavy equipment diggers, holes quickly and easily made in any soil type. Wood auger may be attached for wood drilling.

HAYNES TREE GIRDLER

FOR DETAILS SEE YOUR DEALER OR WRITE:
HAYNES MFG. CO. LIVINGSTON, TEXAS, U. S. A.

Forestry News

Bill to Cure Mining Claim Abuses Signed

On July 23 the long awaited and much discussed measure to deter false mining claims on public lands became law by the signature of President Eisenhower. Legitimate mining interests and conservationists in general are hopeful that a cure has been found for one of the worst headaches afflicting administration of the public lands.

The corrective measure attacks the problem of mining claim abuses in three ways: (1) it removes deposits of common sand, gravel, stone, cinders, pumice and pumicite from under the mining laws and makes such materials subject to disposal by sale or lease under the Secretary of Agriculture on the national forests, under the Secretary of Interior on other public lands; (2) it guarantees access to the federal government and its permittees for the purpose of managing timber, forage, wildlife and other surface resources on unpatented mining claims, so long as such activities do not interfere with legitimate mining operations; and (3) it provides a procedure for clearing land of bogus claims.

Locators who hold valid claims on the date the new law took effect retain all the rights they held under the old law. When a claim goes to patent under the new law, the locator will secure full title to the surface as well as the minerals, just as under the old law.

Senator Clinton P. Anderson and Representative Rogers introduced companion bills in the House and Senate which represented long and diligent work in attempting to reconcile the views and aims of the mining interests, government agencies, and conservation groups. Senator Anderson credited the American Forestry Association with a major role in culminating several years of effort on the part of law makers and others to bring about an intelligent answer to the illegitimate claims problem. The association has long fought for mining laws revision and last February called a conference among vitally interested parties that resulted in the drafting of bills acceptable to all parties.

The Council of the Society of American Foresters in June of 1953 adopted a policy statement calling for revision of the laws dealing with mining claims on federal forest lands in the public interest. It is expected that the new law will go a long way toward correcting past abuses.

California Studies Use of TV for Fire Detection

The T.V. camera, now adapted to many industrial uses, can also be a useful tool in a modern forest fire detection system. This was the conclusion reached by the California Division of Forestry as a result of a four-day preliminary demonstrational and experimental study conducted jointly with the Hancock Electronic Corp. of Oakland at the Division's Mt. Danaher Ranger Unit Headquarters in Eldorado County in June. The brief study was conducted to provide both the manufacturer and the Division with preliminary information concerning possibilities and problems of adapting the T.V. camera to forest fire detection uses.

Television equipment for the test consisted of a remotely controlled camera mounted atop a standard forest fire lookout tower. Several T.V. monitors or screens connected to the camera by coaxial cable were located in a forestry station nearby. The camera, controlled by the operator in the forestry station, could be rotated 360° and could be stopped or its direction changed to survey any given area. Test smokes were set off at distances from seven to thirteen miles from the camera and the smoke from sawmill burners up to eighteen miles away were observed. In comparison, a trained observer equipped with binoculars is considered to have a maximum efficient viewing distance from a forest fire lookout tower of about fifteen miles.

As a result of the tests, several problems associated with the television equipment were determined to require more study. These include the relationship between rate of scanning, size of lens, and field of vision; number of monitors that one observer can watch at one time, and an evaluation of the fatigue factor of an observer who is watching the monitor screens continually.

The study revealed that to be effective the television camera adapted to this use must be equipped with several lenses. A lens of low magnification and broad field of vision is needed for general scanning. Lenses of higher magnification are needed for close scrutiny of specific areas. The operator in the forestry station must be able to change lenses at will. It was found that haze, smoke, and sunlight

FAST TREE TRIMMING SAW

Makes *fast-clean-easy* cuts and is easy to file.

No. 1248

Unique design allows teeth to cut full length of blade. 4 teeth per inch.

PRICE $6.95 ea.

Delivered to U. S. A.

Write for Free Catalog of Tree Trimming Tools and Supplies

BARTLETT MFG. CO.

3015 E. Grand Blvd. Detroit, Mich.

20 MILLION TREES *a Year!*

Note Heavy Roots and Sturdy Top of Musser seedling in photo.

Seedlings for Christmas Tree and Forest Tree plantings; Transplants for Conservationists, Timber Operators and Farmers.

MUSSER offers the world's largest selection of quality trees, at a price made possible by tremendous volume.

Write for Tree Catalog, wholesale planting list and prices. Ask for Free Christmas Tree Growers' Guide.

MUSSER FORESTS, INC. BOX 26-I INDIANA, PA.

MAKING WOOD SERVE AMERICA BETTER THROUGH GOOD FOREST MANAGEMENT

GEORGE WILCOX PEAVY (1869-1951), founder and dean (1910-1940) of Oregon State College school of forestry. Nearly a half century ago, Dr. Peavy foresaw the growing need for more trained foresters. The 1,381 graduates of the school he founded have contributed to a permanent wood supply by applying modern forestry practices on commercial timberlands.

schools of forestry develop men and trees for tomorrow...

Naturally beautiful, wood is the favorite home-building material. To assure an endless supply, industrial tree farmers are scientifically managing timber as a crop.

"Grower of trees and men... educator and executive." With these words, associates of Dr. George Peavy summed up his lifetime of leadership in forestry education. Through the vision of educators like Dr. Peavy, the nation's system of forestry schools was firmly established early in this century. Today, their graduates are helping to perpetuate America's wood supply on both public and private lands.

Private industry employs about half of all graduate foresters in the nation. Many supervise commercial tree farms ... growing and harvesting timber as a continuous crop, and protecting trees from fire, insects and disease. Others are engaged in constant research to improve both productivity of industrial forestland and quality of wood grown. These practices are applied by professional foresters in managing Weyerhaeuser Timber Company forestlands as certified tree farms.

America's 6,200 privately owned tree farms are in capable hands. Such tree farms can always supply wood for lumber, pulp, paper and the more than 4,000 other wood products everyone needs and uses. *Write us at Box A, Tacoma, Washington for more information about modern industrial forestry.*

Weyerhaeuser Timber Company

CUT COSTS 90%
PREVENT ACCIDENTS
• WASH WINDOWS FOUR STORIES HIGH
REMOVE LIGHT GLOBES 60 ft. up
• PRUNE TREES & PICK FRUIT 60 ft. up

DEPT. J , 300 S. Los Angeles St., L.A. 13, MA 6-9387

IMPROVED BUZZ SAW ACTION
CUTS ALL RECORDS
THIS NEW I-E-L
5 full horsepower Diaphragm carburetor. Instant throttle response in any position
MODEL HM
WRITE TO . . .
I-E-L POWER SAWS
1112 Westlake N., Seattle 9, Wn.
For Name of Your Nearest Distributor

BERNARD
Kamp-Pack
"OUTDOOR FOOD" HELPS RANGERS, FORESTERS, TRAVEL LIGHT and FAST
Delicious non-perishable food is concentrated for easy carrying. 25 pounds finished food weighs only 9 pounds. Nothing to add but water. 12 full meals in waterproof foil packets. Used by forest rangers as regular food for lookouts, emergency food when fire-fighting. Used by foresters, too.
Write for KAMP-PACK booklet and Bernard INSTITUTIONAL FOOD LISTS for *he-man* lumberjack meals.
BERNARD FOOD INDUSTRIES . . . 2 plants to serve you
P O. Box 487, San Jose, Calif. • 559 West Fulton Street, Chicago 6, Ill.

conditions also adversely affect observations with the television camera just as they do a human lookout observer. The study indicated that further tests with lens filters may prove the television camera to have an edge over the human lookout in ability to penetrate haze conditions.

The Division hopes to continue this experimental work in cooperation with the industry.

Lawmakers Propose Parity Prices for Timber Products

Three bills have been introduced in the 84th Congress to authorize the Secretary of Agriculture to establish a system of price reporting on basic forest products for farmers; to provide for the expansion of research in the marketing of such products; and to conduct a study of price trends and relationships and within two years recommend to the Congress an appropriate formula for the establishment of parity prices for such products.

A Senate bill (S. 2105) was introduced by Senators Humphrey, Nueberger, and Sparkman. Two House bills were introduced by Congressman Blantnik (H. R. 6582) and Congressman Metcalf (H. R. 6652). They were referred to committee.

Advertising Council and Forestry Officials Discuss Smokey Bear

The Advertising Council and executives of the Foote, Cone & Belding advertising agency, Los Angeles, at a recent meeting in Washington, D. C., presented the proposed Smokey Bear Forest Fire Prevention Program for 1956.

This marked the 15th consecutive year that Foote, Cone & Belding has planned the annual Forest Fire Prevention Program as a public service. Allan Wilson, acting president of the Council, pointed out that the Smokey Bear Program is the longest continuous public service program ever put on by anybody in advertising.

Richard E. McArdle, chief, U. S. Forest Service, was chairman of the meeting which, in addition to state and federal forestry officials, included representatives of the Boy Scouts, Girl Scouts, Bureau of Indian Affairs, American Forest Products Industries, Sport Fishing Institute, Forest Farmers Association, Virginia Forests, Inc., Junior Red Cross, Red Cross, National Education Association, Fish and Wildlife Service, the White House, Creative Arts Studio, Government Printing Office, U. S. and Junior Chambers of Commerce, National Association of Home Builders, District Fire Department, Acacia Life Insurance Co., National Rifle Association, Bureau of Land Management, Daughters of the American Revolution, National Park Service, National Retail Lumber Association, Office of Education, Editor of the *Grundy County* (Tenn.) *Herald*, Ground Observers' Corps, and the Treasury Department's Bond Drive.

Private & Industry

Plywood Industry Marks Fiftieth Anniversary

The Douglas Fir Plywood Association met in Portland, Ore., in June to celebrate its fiftieth birthday. In 1905 Peter Autzen and Gustav A. Carlson of the Portland Manufacturing Co. were requested by officials of the Lewis and Clark Exposition to prepare an exhibit. They came up with panels of plywood made from Douglas-fir. Other woods had been used in making panels in the East and in Europe, but never before Douglas-fir. The Portland Manufacturing Co. got its first orders soon after the Exposition opened.

First used exclusively by door manufacturers, Douglas-fir plywood is now a versatile material with scores of uses. The development of waterproof glue, perfected in 1935, is noted as the most important technical advance in the industry's history and one which opened vast new markets.

Today 100 Douglas-fir plywood mills in Washington, Oregon, and California provide employment for 24,000 workers with an annual payroll of $115,000,000. In the industry's fiftieth year it will produce about 4 billion feet of plywood.

Record Tree-Planting Program in South

The southern pulp and paper industry accounted for 181,856,000 trees being planted over an 11-state area in 1954-55, an all-time record for this region, according to the Southern Pulpwood Conservation Association.

H. J. Malsberger, forester and general manager of S.P.C.A., who made the survey, said, "Planting records show that 50 pulp mills and 31 suppliers of pulpwood from Virginia to Texas exceeded their 1954 record by over one and one-half million trees."

It was estimated that the planting program covered 300,000 acres. The survey revealed that industry planted on its own lands 133,307,000 trees while pulpwood suppliers planted 4,820,000. The pulp and paper industry gave private landowners 42,904,000 trees while suppliers contributed 825,000 trees, a combined total of 43,729,000 trees given to landowners free.

Pulp and Paper Foundation Awards 14 Scholarships

The School of Forestry at North Carolina State College has announced the award of 14 scholarships, valued at a total of $23,400, to top-ranking students with funds provided by the Pulp and Paper Foundation, Inc.

Announcement of the list of scholarship recipients was made by Dr. Richard J. Preston, dean of the college's School of Forestry, and Prof. C. E. Libby, head of the Pulp and Paper Technology Curriculum, who said the awards represent the first industry-wide scholarship program of its type in the United States.

Students chosen as the scholarship winners will enroll in the pulp and paper training program of North Carolina State College's School of Forestry, which has been designated as the South's only approved pulp and paper technology training center by the Southern Regional Education Board. The college is now erecting a $225,000 Pulp and Paper Laboratory, which will be used to strengthen the regional educational project.

The scholarship committee represents the 18 pulp and paper companies who are currently supporting the Pulp and Paper Foundation and its scholarship program.

The scholarship winners will each receive $600 a year during their college studies or a total of $2,400 for four years of study.

Gair Woodlands Scholarships Announced

Two forestry scholarships, each amounting to $2,000 for four years of study, have been awarded by the Gair Woodlands Corporation of Savannah, Ga., in what has become an annual program of the company. This year scholarships went to high school graduates Richard A. Blair of Jasper, Fla., who will attend the School of Forestry, University of Florida, and Billy G. Edenfield, Cobbtown, Ga., who goes to the School of Forestry at the University of Georgia.

In announcing the awards T. W. Earle, president of the corporation, said that their purpose was to encourage outstanding high school graduates to enter forestry as a profession.

The awards committee making the selection in Georgia consisted of Guyton DeLoach, director of the Georgia Forestry Commission, Dean D. J. Weddell of the School of Forestry, and S. A. Boutwell, chief forester for the corporation. In Florida C. Huxley Coulter, state forester, Henry J. Malsberger, Southern Pulpwood Conservation Association, Dean C. M. Kaufman of the School of Forestry and Mr. Boutwell made the final selection.

Scott Paper Co. Establishes Yale Scholarship

William D. Ticknor, III, of Englewood, N. J., has been named the first recipient of the Gilbert Kinney Fellowship in Forestry at Yale University, it has been announced by George A. Garratt, dean of the Yale School of Forestry.

The fellowship was established this year by Scott Paper Co. Foundation, Chester, Pa., in honor of the late Gilbert Kinney, Yale Class of 1905 and for many years a director of Scott Paper Co.

The fellowship provides $1,000 yearly for the student and a similar sum each year to Yale. Selection of the recipient is made by the Yale School of Forestry, and, under the terms of the fellowship, is based upon scholastic achievement of the student, his personal development, and his intention to enter private or industrial forestry upon completion of his studies.

The Fellowship places no restriction on the recipient as to employment after graduation, but along with the award goes an offer of summer employment, and after graduation, permanent employment with Scott Paper Company.

The grant is in line with the current trend in the nation toward industrial support of private institutions of higher learning.

Thompson Chemicals

Thompson Research

leads to new high standards in the control of HARDWOODS & MIXED BRUSH in

Conifer Stands

Thompson field research in the development and application of selective herbicides, the most extensive in America, makes possible far greater and more economical control of undesirable woody species than heretofore.

Whether applied by foliage spray or year 'round basal bark or stump treatment, Thompson's improved, simplified techniques and advanced Broad Spectrum formulations produce unparalleled results.

Thompson Field Research Station Paper 18 (expanded) providing important data on spray techniques, comparative kills by esters, and cost evaluating criteria is available on request. Our Research Staff will be pleased to answer specific queries without obligation.

Research Department
THOMPSON CHEMICALS CORP.
3032 Locust Street, St. Louis 3, Mo.

FIRST NAME IN HERBICIDES

BACK COPIES JOURNAL OF FORESTRY NEEDED

With the exception of a few issues the Society has an adequate reserve of back copies of the JOURNAL OF FORESTRY. Needed at this time, however, are copies of *only* **Volume 50, Nos. 1 and 4 (January and April 1952).** Members may donate these issues or receive credit of *50 cents per copy* on their dues.

When sending these needed copies please be sure to indicate if they are donated—or if credit on membership dues is desired.

Send to

SOCIETY OF AMERICAN FORESTERS
Mills Building
Washington 6, D. C.

THE LOWTHER TREE PLANTER PLANTS 10,000 SEEDLINGS PER DAY!

With the Lowther Tree Planter, trees are properly planted for maximum survival in any soil because they have been given the right start.
Three distinct models available to cover all soil conditions and terrain.

●

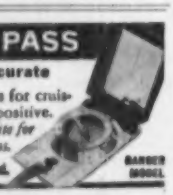
For details, write:

THE HARRY A. LOWTHER COMPANY

INDUSTRY AVE., JOLIET, ILL.

By The Makers Of The Famous Lowther C-Saw

SILVA COMPASS
Simpler — More Accurate
Recommended by foresters for cruising. Easier to use, faster, positive. Direct course readings. *Write for free literature and instructions.*
SILVA, INC., Dept. J, La Porte, Ind.



AUTOMATIC OVERHEAD IRRIGATION FOR TREE NURSERIES
WHITE SHOWERS, INC.
17514 Woodward Detroit 3, Mich.

Paul E. Bruns Becomes a Consulting Forester

Paul E. Bruns on June 30 resigned as associate professor of forestry at Montana State University, to establish his own consulting forestry business.

After obtaining his M.F. degree at Yale in 1940, Mr. Bruns served in the Army Air Force, then briefly with the Northeastern Forest Experiment Station, and for two years with a veneer company in Vermont. During his teaching assignment at Montana State University, he held a Weyerhaeuser research fellowship at the University of Washington.

He is the author of the book *Applied Forest Management*. His address is 119 Mount Avenue, Missoula, Mont.

PAUL E. BRUNS

Two Paper Firms Announce Merger

J. D. Zellerbach, president of Crown Zellerbach Corp., and Edwin J. Spiegel, president of Gaylord Container Corp., have announced plans for merger of the two companies.

Crown has forest lands and principal plants in the Pacific Northwest and British Columbia and offices in Portland, Ore. Gaylord, with headquarters in St. Louis, Mo., has mills in Louisiana and Ohio and forest lands in Mississippi and Louisiana.

Crown annual sales amount to $300 million; Gaylord's to $90 million. Crown will take over Gaylord by offering two shares of its common stock for each three shares of outstanding Gaylord stock.

Long-Bell Expanding in Plywood

Long-Bell Lumber Co. president J. D. Leland, has announced plans to construct a new plywood plant at Vaughn, Ore.

This additional plant will be the company's fourth plywood plant, and carries on the company's policy of integrating operations to afford maximum utilization of its timber resources, Leland said.

Construction of the plant will start immediately, and it is expected to begin producing plywood by March 1, 1956. The plant will have an annual production capacity of 50 million square feet of plywood on a two-shift five day basis and will incorporate the latest improvements in equipment and design.

It is expected that about 250 men will be employed with an annual payroll in excess of a million and a quarter dollars.

E. R. Wagoner Temporary Secretary Texas Forestry Association

E. R. Wagoner has accepted employment as acting executive-secretary of the Texas Forestry Association on a temporary basis, S. W. Henderson, Jr. president of the Association has announced. Wagoner will fill the vacancy created by the resignation of Bruce Stewart.

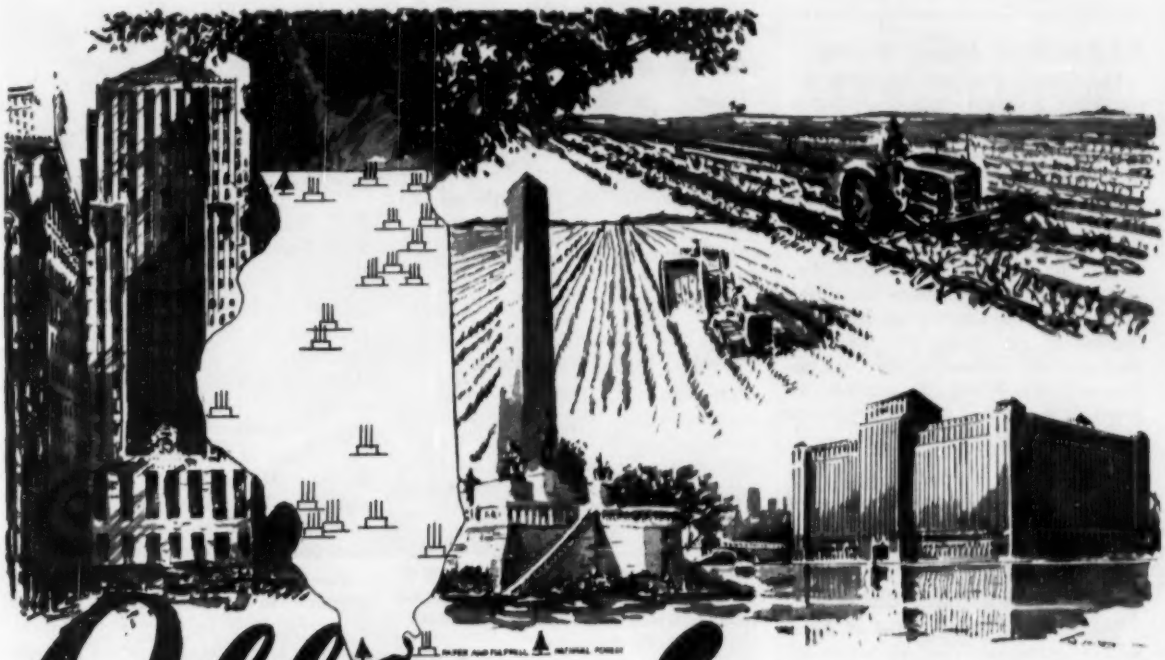
For the past six years Wagoner has been head of the Education Section of the Texas Forest Service at College Station and served as editor of the *Texas Forest News*. He holds degrees in forestry from the University of Georgia and Duke University. Wagoner spent five years on active duty with the U. S. Air Force and continues to be active in the Reserves, holding the rank of Lieutenant Colonel.

The Texas Forestry Association, with headquarters in Lufkin, is a 40-year-old, statewide educational organization promoting the conservation, protection, development and wise use of the forest resources of the state. The objective of the Association is to increase the production, employment and income from the forests of Texas.

G. L. Heinemann to Hammermill Post

Gerhard L. Heinemann, a farm forester with the Missouri Conservation Commission for the past six years, has been appointed district forester at Coudersport, Pa., for Hammermill Paper Co. of Erie. He will be in charge of procurement and Hammermill forest land in the area. In the position he succeeds David E. Strong, who resigned to enter the consulting field. Heinemann is a 1949 graduate of the State University of New York College of Forestry.

No. 11 of a series featuring state forestry practices, projects and products . . .



Illinois

An Integrated Program of Farm Forestry

ILLINOIS—The flat, fertile "Prairie State" has become world renown for its unending corn fields, its financial prowess, and its manufacturing wizardry. And, equally prized but less famous, are the Illinois timberlands which were first brought into prominence by that great log-splitter, Abraham Lincoln. Even today, Illinois is well aware of the value and potentiality of its 4,000,000 acres of native woods, its 100,000 acres of forest plantations, and its 2,500 primary and secondary forest industries.

Illinois forestry means farm forestry. With well over 90% of this state's natural forest resources occurring as 20-40 acre woodlands as part of larger farm units, it is only natural that the many state, federal, and private forestry endeavors are largely aimed at this one key individual . . . the Illinois farmer.

The University Forestry Extension Service attracts his interest through demonstrations and group meetings. The State Division of Forestry services him individually through its farm forestry program (12 projects), its reforestation program (2 nurseries), and its fire-control program. The Federal government aids him through its research efforts (branch station at Carbondale), its "show-case" ownership of the Shawnee National Forest, and its Federal-aid cooperative programs. Private efforts include active support and participation in existing programs.

The result has been a steady flow of timber products from Illinois' diversified hardwood forests. Basket veneer (for the fruit industry) from the "soft" bottomland hardwoods; face veneer from the high-quality walnuts and oaks; tight cooperage from the upland white oaks; piling pieces from the straight, fast-growing pin oaks; good, usable native lumber from all species; and many, many others. Yes, Illinois has a right to be proud of its industries and its agriculture, and also its many farm woodlands.

—STATE DIVISION OF FORESTRY—*contribution to this series does not necessarily constitute endorsement of Southern Glo products.*

Just as modern industrial methods replace the axe in log-splitting today, so foresters find paint their modern ally in marking trees. With these foresters, SOUTHERN GLO tree marking paints are often favored. Their exclusive formula #71020 keeps SOUTHERN GLO paste, ready-mixed and boundary paints soft and pliable, easier to use. Many practical uses of this modern forestry tool are covered in the bulletin "Marking Trees with Paint." Write for your FREE copy today.

SOUTHERN COATINGS AND CHEMICAL COMPANY, Dept. 2, Sumter, South Carolina

Allied

F.P.R.S. Holds Annual Meeting

The Forest Products Research Society held its ninth annual meeting at Seattle, Wash., in June. Four hundred ninety-three persons registered. Main concern of the convention was how to make economic use of an annual 100 million tons of wood residue left in mill and forest.

Moss B. Christian of Tallulah, La., was installed as president, succeeding Lester J. Carr. Election of Ralph H. Bescher of Pittsburgh, Pa., as president-elect for the coming year was announced. Dr. Frank H. Kaufert, director of the School of Forestry at the University of Minnesota is vice president.

Education

Michigan State Name Changed

The Michigan State Board of Agriculture announces that by action of the Legislature the name of Michigan State College of Agriculture and Applied Science, East Lansing, has been changed to Michigan State University of Agriculture and Applied Science. This became effective July 1, 1955.

Fred Winch in Libya

Fred E. Winch, Jr., extension forester of New York with headquarters at Cornell University, is on leave of absence serving as agricultural extension advisor for the International Cooperation Administration in Libya.

His headquarters is at Bengasi, Cirenaica.

R. A. Zabel Heads New York Forest Botany Department

Dr. Robert A. Zabel has been named chairman of the department of forest botany at the State University College of Forestry, Syracuse, N. Y., according to an announcement by Dr. Hardy L. Shirley, dean.

He succeeds Dr. Ray R. Hirt who has retired from administrative work to become senior professor in order to concentrate on completion of important research problems.

An associate professor, Dr. Zabel has been a member of the College of Forestry faculty since 1946. He received a B.S. degree from the University of Minnesota in 1938. He was awarded the Master's and the Doctor of Philosophy degrees by State University College of Forestry in 1941 and 1948.

Dr. Zabel is author or co-author of eight important publications in the field of forest pathology.

J. F. Hamilton Accepts New Position

James F. Hamilton has been appointed field technologist and associate professor in the Forest Products Research Division at Michigan College of Mining and Technology according to an announcement by Dr. Grover C. Dillman, president of the college.

Professor Hamilton received his B.S. degree from the New York State College of Forestry at Syracuse University and the Master of Forestry degree from Yale University.

For the past three years he has been employed in the New England area as a woodworking industry development engineer specializing on wood particle board development for the Souhegan Mills and the Precisionwood Corporation.

PANAMA PRESSURE TYPE TREE MARKING GUN

Approved for use by U. S. Forest Service

ENABLES THE OPERATOR TO:

Mark more trees with less paint—

Carry his supply of paint on his back instead of in his hand—

Clean his tip automatically each time he marks a tree—

Operate with complete freedom of both hands—

Clean his Gun more readily at the end of a day's work—

And all together do a better, faster and more economical marking job—

Constantly increasing sales indicate that we have a

SATISFACTORY TREE MARKING GUN

PANAMA PUMP COMPANY

HATTIESBURG, MISS.

MEASURING DEVICES FOR LUMBERMEN

• BOARD RULES • LOG RULES • STEEL TAPES
• TREE TAPES • LOG CALIPERS • LUMBER GAGES
• CRUISER STICKS • FOLDING LOG RULES

For nearly three generations lumbermen and foresters the world over have relied on Lufkin for top quality measuring devices. Today the industry recognizes Lufkin products as The Standard of Accuracy for its measuring needs.

For your free copy of the 12-page booklet, *Lufkin Board and Log Rules*, send the coupon below.

BUY LUFKIN TAPES • RULES • PRECISION TOOLS FROM YOUR SUPPLY HOUSE

THE LUFKIN RULE CO., SAGINAW, MICHIGAN
132-138 Lafayette St., New York, N.Y. • Barrie, Ontario 225

FREE BOOKLET

THE LUFKIN RULE CO., Dept. JF, SAGINAW, MICHIGAN

Gentlemen: Please send me your free 12-page booklet on Lufkin Board and Log Rules.

NAME_____

ADDRESS_____

CITY_____ STATE_____

SEVEN MILLION Douglas-fir two-year seedlings are being inspected by Washington Governor Arthur B. Langlie and Nursery Forester Homer A. Ward of the State Division of Forestry. Scene is the Capitol State Forest Nursery which will this year produce one-third of the seedlings needed by state, federal, and private forest landowners in Washington. Next year the nursery will be called upon to produce over nine million seedlings to provide stock for rehabilitation of the Yacolt Burn in southwest Washington.

Oxford University School of Forestry Jubilee

On October 1 this year the Oxford University School of Forestry will celebrate the fiftieth anniversary of its opening in 1905. A program to commemorate the event will include an address at the Imperial Forestry Institute, a luncheon at St. John's College, and a visit to Bagley Wood. Invitation has been extended to all past and present students of the School and to all persons that have attended courses at the Institute to join in the celebration. The Institute, founded in 1924, has always shared staff and buildings with the School. Professor H. G. Champion, an honorary member of the Society of American Foresters, heads the Institute.

Loblolly Pine Subject of Forthcoming Book

Work on a comprehensive book summarizing all available information on loblolly pine started July 1, according to an announcement by Dr. C. F. Korstian, dean of the School of Forestry, Duke University, and Dr. E. L. Demmon, director of the Southeastern Forest Experiment Station. The book will be written by W. G. Wahlenberg, now with the Southeastern Forest Experiment Station.

Mr. Wahlenberg has devoted a lifetime to silvicultural research in the Forest Service experiment stations. He is the author of the reference book, *Longleaf Pine*, published in 1946 by the Charles Lathrop Pack Forestry Foundation.

The loblolly pine monograph is sponsored by Duke University and is being financed by nine pulp and paper companies, seven suppliers of materials or equipment to the forest industries, one individual timberland owner, the Duke School of Forestry, and the U. S. Forest Service.

APPLIED FOREST MANAGEMENT

"Is the first technical book on forest management that deals with forest land use coordination in detail. The subject of forest management is discussed for all foresters."—*Planning and Civic Comment.*

383 pages . . $5 postpaid.

PAUL E. BRUNS

Consulting Forester

119 Mount Ave., Missoula, Montana

For over ten years
a dependable source
for
Southern Pine Seed

SOUTHERN SEED COMPANY INC.
Baldwin, Georgia

Calders' Forest Road
ENGINEERING TABLES
Complete tables for field work on waterproof paper and acetate cover.
Sent on approval Price 5.00
LESTER E. CALDER and DOUGLAS G. CALDER
1825 Hilyard St. Eugene, Oregon

GROW TREES
FOR XMAS TREES AND FORESTRY
Fir, Pine and Spruce in Variety
Seedlings and Transplants
Write for Price List
Suncrest Evergreen Nurseries
P.O. Box 305, Homer City, Pa.

NEW Portable CENTRIFUGAL HALE Type HPZF

The NEW HALE Type HPZF portable centrifugal Pumping Unit is ideal for fighting fires thru long hose lines. A companion Forester's Workhorse to the PZZ.

Pumps from Draft:
11 U.S. GPM at 200 P.S.I.
28 U.S. GPM at 150 P.S.I.
45 U.S. GPM at 100 P.S.I.

This is based on 80% of available Engine HP and does not represent maximum capacities. The 4 cycle air cooled 8½ HP Engine is easy to start in any kind of weather.

For Detailed Information on HPZF and other Hale Fire Pumping Units Write:

HALE FIRE PUMP CO.
CONSHOHOCKEN, PA.

Consulting Foresters

Professional Services Offered by
Members of the Society of American Foresters

WILLIAM A. EASTMAN, JR.
Consulting Forester
Complete Professional Service
SEATTLE 1, WASHINGTON
410 J. GREEN BUILDING
Phone SEneca 2814

POND & MOYER CO., INC.
Consulting Foresters
Estimates—Appraisals—Surveys
Machine Tree Planting Service
107 HOMESTEAD RD., ITHACA, N. Y.

FOREST APPRAISALS FOREST TAXATION
GROWTH AND MANAGEMENT PLANS
FRANK J. LEMIEUX
Consulting Forester
35 Years' Experience in North and South America
833 WHITNEY BLDG., NEW ORLEANS 12, LA.

KEITH CRANSTON, Consultant
Leland, Mississippi
(Headquarters)
A Southwide Professional Service

GEORGE BANZHAF & COMPANY
632 North Water Street MILWAUKEE 2 BRoadway 6-2062
Consultants to the Wood Using Industries

TIMBER AND MANAGEMENT INVENTORY AND APPRAISAL
OVER 50 MILLION ACRES SINCE 1910
JAMES W. SEWALL COMPANY
FOREST ENGINEERS
OLD TOWN, MAINE
BRANCH: JAMES W. SEWALL CO. (CANADA) LTD., FREDERICTON, NEW BRUNSWICK

SOUTHERN TIMBER MANAGEMENT SERVICE
FORESTRY SERVICES FOR
TIMBERLANDS AND TIMBER OPERATIONS
J. M. BRADLEY—H. E. MURPHY & ASSOCIATES
205 S. 32nd St., Birmingham, Ala.
P. O. Box 262, Lyons, Ga.
404 Montgomery Ave., Sheffield, Ala.
P. O. Box 964, Auburn, Ala.

ENGINEERS • MANAGERS • FORESTERS • APPRAISERS
schultz
C. D. SCHULTZ & COMPANY
Incorporated
Vancouver, Canada Seattle, USA

Government

E. W. Loveridge Begins New South American Assignment

Earl W. Loveridge who recently retired as assistant chief (Branch of Administrative Management and Information) of the U. S. Forest Service, Washington, D. C., after 42 years with the Department of Agriculture, left August 12 for Bogota, Colombia, where he is agricultural attache with the American Embassy.

A 1912 forestry graduate of Penn. State, Mr. Loveridge entered the Forest Service the following year. Most of his early career was in the Southwest, where he rose from field assistant to supervisor to regional forest inspector at Albuquerque. In 1927 he was transferred to the Washington, D. C. office, and was variously assigned to positions in operations, personnel, administration, and fire control. In 1935 he was appointed assistant chief, in which office he served until his retirement in July.

Mr. Loveridge's latest assignment is not his first experience in Latin America. During 1952 he went to Venezuela to make a study for the Ministry of Agriculture of the Republic's natural resource agencies, an assignment sponsored by the American International Association.

He was the recipient of the Department of Agriculture superior service award in 1948, and the distinguished service award in 1951, the only Departmental employee to whom both awards have been made to date.

Clint Davis to Head Forest Service's Division of Information

Clint Davis, director of the Smokey Bear forest fire prevention campaign, has been named chief of the Forest Service's Division of Information and Education. He succeeds Dana Parkinson, who retired June 30 after 45 years with the Service.

Davis, as director of the Smokey Bear campaign for nine years, has worked closely with state foresters, representatives of other government agencies, forest industries, and other business leaders throughout the country. Previous to 1946 he was information director of the Southern Region of the Forest Service.

During his three years as public relations director for the Georgia Game and Fish Department Davis, working with the Forest Service, developed for Georgia the first federal-state cooperative wildlife management area in this

country. He was outdoor editor for the *Atlanta Constitution*, and printer and layout foreman for a publishing firm in Atlanta.

During World War II he served as motion picture technician for the Army Signal Corps. He is a native of Unadilla, Ga.

Parkinson took charge of the information and education work of the Forest Service in 1936. He started the use of color movies by the federal government. He helped launch the Smokey Bear forest fire prevention campaign, enlisting the cooperation of state foresters and the sponsorship of The Advertising Council, and has served as chairman of its executive committee since its beginning in 1942. He also directed the observance of the Forest Service's golden anniversary this year. Much of his field experience was in the Intermountain Region.

He received his bachelor's degree from Dartmouth and his master's in forestry from Yale.

Promotions Announced in California

F. H. Raymond, acting state forester since October, 1953, was appointed California's state forester in June. He was nominated for the position by the California State Board of Forestry and appointed by the director of the Department of Natural Resources, DeWitt Nelson. Raymond, a graduate of Colorado College with a B. S. degree in forestry, has served 24 years in the California Division of Forestry. After two years of work with the California Forest and Range Experiment Station he entered state service in June 1931 as an assistant ranger. In 1936 he was appointed state ranger of the Monterey County Ranger Unit and moved to deputy state forester in charge of the Division's North Coastal District in 1943. In July of 1953 he was appointed chief deputy state forester and in October moved to the position of acting state forester when DeWitt Nelson, former state forester, was appointed director of the California Department of Natural Resources.

State Forester Raymond subsequently announced the appointment of John Callaghan to the position of chief deputy state forester. Callaghan, since 1946, has been deputy state forester in charge of the Division's northern district with headquarters in Redding. Advanced to the position of deputy state forester replacing Callaghan will be senior forest technician George Grogan. Both appointments were effective July 16.

Callaghan has been in state service for 18 years. He joined the Division of Forestry in 1938 as an assistant ranger a year following his graduation from the University of California with a B. S. in forestry.

Grogan obtained his forestry education at the University of Idaho and the University of Michigan where he graduated in 1939. Following graduation he moved to California to work as a timber estimator for the U. S. Forest Service. From 1940-1942 he was with the Red River Lumber Company in Westwood, Calif. He served with the U. S. Navy and was discharged a Lieutenant in 1945 after more than two years of destroyer duty in the Pacific. Grogan returned to the Red River Lumber Company following the war and then entered state service in 1948.

Reforestation Arboriculture
S. GAYLEY ATKINSON
Consulting Forester
Huntingdon Road
Huntingdon Valley, Pa.

THOMAS G. CLARK,
CONSULTING FORESTER
FOREST LAND MANAGEMENT CO.
P. O. BOX 1046
MORGANTOWN, W. VA.

LOGGING COST ESTIMATES APPRAISALS
SURVEYS AND MANAGEMENT CRUISING
INTERMOUNTAIN TIMBER SERVICE
Know Your Timber Values and Logging Costs
THOMAS (Tom) C. CLIFTON Tel. 9-8080
Consulting Forester 1815 So. 10th Ave.
Caldwell, Idaho

TREE FARM MANAGEMENT SERVICE
364 East Broadway, Eugene, Oregon
Protection—Reforestation—Inventory
Utilization—Research
Verne D. Bronson, Chief forester, Phone 5-5371

FOREST PROPERTY
Estimates—Appraisals—Management
Prentiss & Carlisle Co., Inc.
107 Court Street Bangor, Maine

FRANCIS H. CLIFTON
Private Forester
Timber Appraisal and Marketing
Technical Forest Management
1408 North Boulevard Phone 1320
DELAND, FLORIDA

NORTHEAST FORESTRY SERVICE
STANLEY MESAVAGE, *Consultant*
Forest Management
Timber Production
Forest Products Marketing
HAWLEY PENNSYLVANIA

TIMBER MANAGEMENT SERVICE
J. E. HALL R. W. MEZGER
FORESTRY CONSULTANTS
Technical Assistance to Timberland Owners and Operators in the Ponderosa Pine Region
Klamath Falls, Oregon

NORTHERN TREE COMPANY
Professional Forestry Services
Thomas F. Schweigert, Pres.
Member, Association of Consulting Foresters
Penney Building
Petoskey Michigan

Consulting Forester Forest Surveyor
JOHN STOCK
Specializing in Adirondack Forest and Tax Problems
Box 311 Tupper Lake, N. Y.

WILLIAM H. PRICE
FOREST MANAGEMENT
Specializing in
Timber Tax Problems
2626 W. Lynn—Seattle 99, Wash.
Al der 7482

ALBERT G. HALL
Forestry Relations Counsel
Consulting Forester
Member, Association of Consulting Foresters
1740 K Street, N.W., Washington 6, D.C.

Farmcraft Associates, Inc.
Forest services throughout
Louisiana and East Texas
619 WASHINGTON ST.
ALEXANDRIA, LOUISIANA

CHARLES H. BUNTING
CONSULTING FORESTER
Timber Cruising
Appraisals
Scaling *Maps*
Timber Management
2455 Placer St. REDDING, CALIF.
Tel. 2978

Minnesota Forester I Positions Open

An announcement from the Minnesota Civil Service Department, 122 State Office Bldg., St. Paul 1, indicates that until further notice applications will be accepted for civil service appointments to the grade of Forester I in the Division of Forestry, Department of Conservation. A Forester I supervises work in specialized fields of forestry activities in one or more assigned forest management districts. The salary range per month is $290 to $330. Applications are accepted from any American citizen and are not restricted to residents of the state. Age limits are 21 to 35 unless applicant is entitled to veterans' preference under Minnesota law. A written examination is required, and can be forwarded to the employment office or civil service agency nearest the candidate's home. An interview may be required. Interested persons should contact the Minnesota Civil Service Department at the above address.

Forestry Employment

S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiations.

NOTICE TO INDUSTRY

Personnel Placement

A service for industrial firms, foresters, and timbermen—to find the best qualified man for the job. List your openings in forestry and allied fields with me. I can supply information on qualified men. Inquiries handled confidentially.

• • •

Foresters send me data on your training and qualifications. Records are confidential. I maintain industry contacts and can advise you on job openings. No fee required unless position is accepted.

Keith Cranston, *Forestry Consultant*
LELAND, MISSISSIPPI

Position Wanted

Graduate forester, Univ. of Michigan 1950. Age 31, married, 2 children. Now state employed. Four years experience with west coast firm: assistant contract logging supervisor, management and acquisition inventories in virgin and second growth; aerial photo interpretation, mapping, fire control, reforestation supervision, insect surveys, scaling. Desire added responsibility in management with firm in Rocky Mountain or Lake States region. Box J, Journal of Forestry, Mills Building, Washington 6, D. C.

J. S. McLaughlin Appointed Superintendent of Grand Canyon National Park

John Sherman McLaughlin, has been appointed to succeed Preston P. Patraw as superintendent of Grand Canyon National Park.

McLaughlin's career with the National Park Service began as a park ranger in Yellowstone National Park in 1928 after graduation from Colorado Agricultural College with a B. S. degree in forestry.

He spent four years in the Army Air Corps returning to duty as Mesa Verde superintendent for three months before his appointment as superintendent of Grand Teton National Park. In October 1950, he was named assistant regional director of Region Two, with headquarters at Omaha, Neb., the position he held prior to his new appointment.

D. F. Olson Assists Piedmont Hardwood Project

David F. Olson, Jr., of the Southeastern Forest Experiment Station, U. S. Forest Service, has been transferred from Lake City, Florida, to Statesville, N. C., as part of the recently expanded hardwood research program in the Southeast. His research will involve studies of the most feasible methods of rehabilitating Piedmont hardwoods and growing better quality stands at a profit. It is expected that determination of the best soils and sites for the growth of different hardwoods will be part of this new hardwood project sponsored jointly by the federal government, the Duke Power Company, and the Furniture, Plywood and Veneer Council of the North Carolina Forestry Association. The latter organization recently hired Howard J. Doyle as council forester, who is also headquartered at Statesville and will be working jointly with Olson.

Mr. Olson has a B.S. degree in forestry from Michigan State and a M.S. from Duke University, where he majored in forest soils.

Mr. Olson joined the Southeastern Station in 1949 and has had research assignments at Union, S. C., La Belle, Fla., and Lake City, Fla.

State Forestry in Colorado

Everett J. Lee, former state forester of Colorado, which position was abolished June 30 by act of the legislature, was appointed state park director, effective July 1.

Under the 1955 amended law, a new park and recreation board has been set up. At a recent organizational meeting, the board approved Mr. Lee's transfer from state forester to park director.

Russell E. Ford, for many years extension forester of Colorado, recently retired from that position to become state forest leader.

Charles L. Terrell, former state extension conservationist, was appointed extension forester as of July 1.

All three foresters are graduates of Colorado A & M College.

Forest Insect Research Laboratory Established at Ely, Minnesota

A field laboratory for conducting research on forest insects is being established on the Kawishiwi Experimental Forest near Ely, Minn., according to M. B. Dickerman, director of the Lake States Forest Experiment Station in St. Paul.

In charge of the field laboratory will be J. L. Bean, forest entomologist. He will be assisted by Harold Batzer, as well as field assistants.

Dr. H. J. MacAloney, chief entomologist for the Lake States Station, is directing the insect research program.

W. E. Wheeler Heads New Section in Denver Office

Wallace E. Wheeler, until recently staff officer in the Division of State and Private Forestry in the Pacific Northwest regional office of the U. S. Forest Service Portland, Ore., has been promoted and transferred to the Rocky Mountain Region with offices in Denver, Colo. There he will head a newly created Section of State and Private Forestry.

Wheeler has had wide experience in the Pacific Northwest since first serving as a forest guard on the Mt. Hood National Forest in 1923. He is a 1932 forestry graduate of Oregon State College and is a second generation forester, son of E. W. (Gene) Wheeler.

The new section that Wheeler will head was created as the result of organizational changes in the Denver office. These changes have been made to permit the Division of Timber Management, headed by A. L. Nelson, to initiate an expanded program of timber surveys in conjunction with the research branch of the Forest Service. The survey work in turn has resulted from growing interest on the part of timber operators in developing lodgepole pine and Englemann spruce resources in Colorado and Wyoming. To enable the Timber Management Divi-

sion to undertake its expanded program all state and private forestry activities have been shifted to the new section in the Division of Information, State and Private Forestry, and Fire Control, headed by J. N. Hessel.

D. G. Fellin and H. R. Dodge Join Intermountain Forest Insect Laboratory

Recent additions to the Missoula, Mont., Forest Insect Laboratory of the Intermountain Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture, Ogden, Utah, are David G. Fellin and Dr. Harold Rodney Dodge. Mr. Fellin received his B.S. degree in forestry from the University of Idaho in 1952. He received his appointment as forester with the U. S. Forest Service shortly after and was assigned to the Coeur d'Alene National Forest in Idaho. After two years of military service in Japan, he returned to the Coeur d'Alene Forest from which he recently transferred to the Intermountain Station with assignment as entomologist with the Forest Insect Laboratory. Mr. Fellin is assisting in the Laboratory's forest insect survey program.

Dr. Dodge came to the Laboratory from the Communicable Disease Center, U. S. Public Health Service, Atlanta, Ga. He received his B.S. degree in entomology from the University of Wisconsin in 1935 and completed his M.S. degree in 1937 from the University of Minnesota with a thesis on "The Bark Beetles of Minnesota (Coeleoptera: Scolytidae)." His Doctorate in Entomology was received from Ohio State University in 1945. Following his assignment as technical director of the 1955 Montana spruce budworm control project, Dr. Dodge will undertake a long-range study of the biology and ecology of the spruce budworm in the Intermountain Station territory.

Pennsylvania Foresters Retire

Two of Pennsylvania's well known foresters were recently retired after long service in the Department of Forests and Waters.

Raymond B. Winters, district forester of the Bald Eagle State Forest, Mifflinburg, Pa., has completed 48 years of service. He was graduated from the old Pennsylvania State Forest Academy at Mont Alto in 1910.

Charles E. Zerby, district forester of the Gallitzin State Forest District, Johnstown, Pa., has completed 45 years of work in forestry, all but four of them with the Department of Forests and Waters. He is a graduate also of the old Pennsylvania State Forest Academy, class of 1913.

W. T. Doolittle Accepts New Post at Southeastern Station

Warren T. Doolittle has recently been named assistant chief of the division of forest management in the Southeastern Forest Experiment Station's office at Asheville, North Carolina. He was formerly with the Station's Southern Appalachian Research Center. Dr. Doolittle received his forestry schooling at Iowa State College and Duke University. He was awarded his doctorate from Yale University this spring for work at the Bent Creek Experimental Forest on the relation of soil characteristics to the growth rate of mountain hardwoods. He has been with the U. S. Forest Service 9 years, with time out for military service. During World War II he served 3 years, with an additional 1½ years during the Korean crisis.

TREE CLIMBERS

Save time, eliminate leg irons, by using

LIGHTWEIGHT MAGNESIUM LADDERS.

Built in Sections, 6', 7', 8', especially for tree climbing purposes. Sections fit into each other and brackets hold ladder away from tree to provide toe hold for climber.
Weight: 1¼ lbs. per foot. Reasonably priced. Long lasting. Guaranteed.

A Complete Line of Ladders—All Types

MODERN MAGNESIUM PRODUCTS, INC.
Palmer, Massachusetts

World's most powerful ALL-IN-ONE POWER MEGAPHONE...

AUDIO Hailer

Send for free literature.

AUDIO EQUIPMENT CO., Great Neck, N. Y.

NOW . . new CUSHION BASE

absorbs road shocks & vibration, reduces wear, increases life of

FORESTER
SEAL TITE
DRIP-TORCH

Proved superior in over 9 years field service

•

Approved for use by U.S. Forest Service

•

NO Flash-back
NO Fuel slopping
NO air-pump
NO pre-heating
NO pressure build-up
NO explosive vapors
Instant operation

SAFE — EFFICIENT
RELIABLE — ECONOMICAL

Burns Diesel Fuel or Stove Oil

Write for folder & price list

WESTERN FIRE EQUIPMENT CO.
69 Main St., San Francisco 5

Index to Advertisers

	Page
Atkinson, S. Gayley	701
Audio Equipment	703
Banzhaf & Co., George	700
Bartlett Mfg. Co.	692
Bernard Food Industries	694
Bruns, Paul	699
Bunting, Charles H.	701
Calder, Lester E., and Douglas	699
Caterpillar Tractor	3rd Cover
Chapman Chemical	626
Clark, Thomas	701
Clifton, Francis	701
Clifton, Thomas	701
Cranston, Keith	700, 702
Eastman, Wm. A.	700
Farmcraft Associates	701
Forestry Suppliers	690
Hale Fire Pump	699
Hall, A. G.	701
Haynes Mfg. Co.	691
Homelite Corp.	4th Cover
I. E. L. Power Saws	694
Keuffel & Esser	684
Kurfew	688
LaPierre-Sawyer	689
Lemieux, Frank J.	700
Lind Co., A. L.	691
Lowther Co., Harry A.	696
Lufkin Rule	698
Melin Meteorological Service	688
Modern Magnesium	703
Musser Forests	692
Nelson Company	687
Northeast Forest Service	701
Northern Tree Co.	701
Panama Pump	698
Pond & Moyer	700
Prentiss & Carlisle	701
Price, Wm. H.	701
Rich Forest Fire Tool	688
Ronald Press	685
Rootspred	686
Ryker, Harrison C. Inc.	688
Sandvik Saw & Tool	689
Schultz, C. D. & Co., Ltd.	700
Sebrell Corp., J. B.	694
Sewall Co., James W.	700
Silva	696
Smith, A. R.	688
Smith Co., D. B.	2nd Cover
Southern Coatings & Chemical	697
Southern Seed Co.	699
Southern Timber Mgmt.	700
Stainer, Julius	688
Stock, John W.	701
Suncrest Evergreen	699
Thompson Chemicals	695
Timber Mgmt. Service	701
Tree Farm Mgmt.	701
Wenzel Co.	686
Western Fire Equipment	703
Weyerhaeuser Timber	693
White Showers	696

Northeastern Forest Research Advisory Council Considers Research Scholarship Program

The Northeastern Forest Research Advisory Council held its 32nd annual meeting on June 16-18 at Intervale, N. H.

The Council, whose function is to coordinate research activities in the Northeast and to advise the Northeastern Forest Experiment Station of the U. S. Forest Service, voted to set up a scholarship committee to "investigate the possibilities of developing a fellowship program" to help finance advanced study for research men.

This action was taken after Ralph W. Marquis, director of the Station and secretary of the Advisory Council, had pointed out the financial difficulties a research man faces today when he leaves his job to go back to graduate school for an advanced degree.

Dr. Marquis pointed out that it is the policy of the Forest Service to encourage advanced study. Many small fellowships and grants are available, he said, and these are helpful to a single man. However, a $1,000 fellowship is not of much help to a man who has acquired a family and two or three children and wants to go back to graduate school. He can do so only at a great sacrifice, and the cost may often discourage the man.

The scholarship committee will study the possibilities of raising a fund of several thousand dollars that could be used to help research men of the Northeastern Forest Experiment Station finance their advanced studies.

Karl A. Swenning, general woods manager of the Hollingsworth & Whitney Division of Scott Paper Company, was appointed chairman of the scholarship committee. Other members are A. D. Nutting, forest commissioner, Maine Forest Service; and William C. Bramble, professor of forestry, Pennsylvania State University, University Park, Pa.

The Advisory Council elected George A. Garratt, dean of the Yale University School of Forestry, for its new chairman. He succeeds H. C. Buckingham, state forester of Maryland. Karl A. Swenning was elected vice chairman, and Dr. Marquis was re-elected secretary.

The Council is made up of state foresters, forestry school heads, representatives of forest industries, and federal, state, and private forest research agencies. Some 50 persons attended the meeting.

Wood Preservation Test

Measuring the penetration of pentachlorophenol in wood is made extremely simple and accurate through recent modifications of a test which has been used for some time. This procedure, known as the Beilstein test, is described in a new technical newsletter issued by Chapman Chemical Company, distributor of pentachlorophenol for the Dow Chemical Company.

The modified Beilstein test has these advantages, the company reports: it is extremely sensitive; requires very simple and inexpensive apparatus; is flexible enough to fit a wide variety of conditions; indicates the presence of pentachlorophenol, not the carrier; is independent of moisture in the wood, and is equally adaptable to laboratory and field conditions of testing.

Copies of Chapman Technical Newsletter No. 15 describing the test, with illustrations, are available on request to Chapman Chemical Company, Memphis 1, Tenn. Also available are copies of 14 other technical newsletters, prepared since 1950, on various subjects pertaining to wood preservation with pentachlorophenol-petroleum solutions.

Brush Cutter Attachment

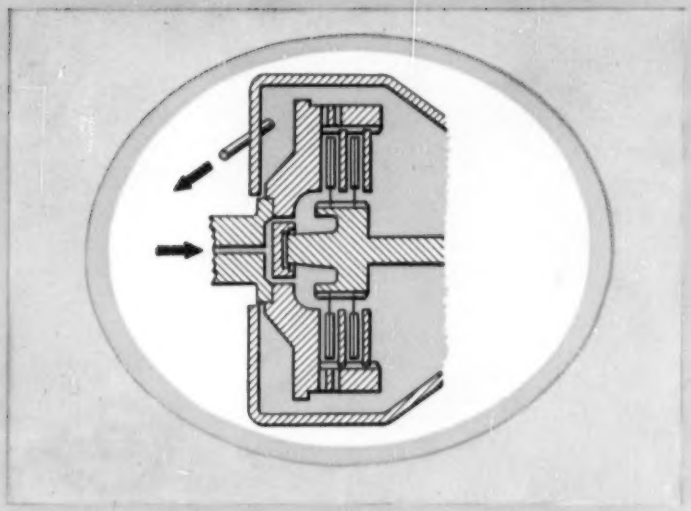
A new attachment that converts the Homelite Model 17 chain saw into an all-purpose brush cutter, has been announced by the Homelite Corporation.

According to the manufacturer, this new brush cutter makes easy and quick work of clearing large areas overgrown with brush, weeds, and small saplings. Designed primarily for use by land clearing contractors, road crews, pipe line companies, railroads and utilities, park and forestry departments, the new brush cutter is said to do clean-up jobs on brush and weeds four times faster than old fashioned hand clearing methods.

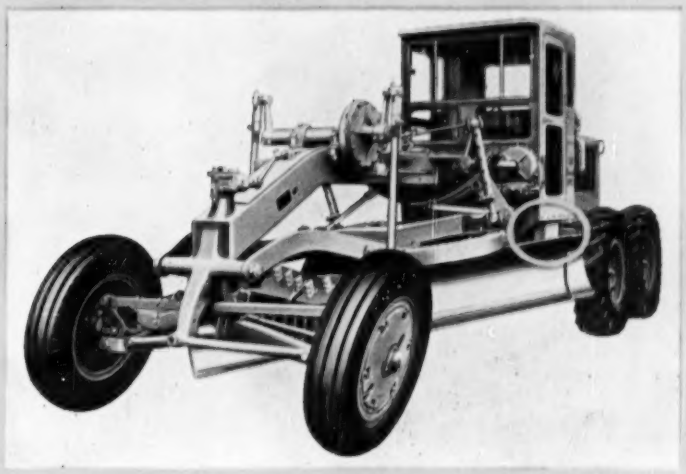
Ruggedly constructed and powered for continuous use by commercial cutters, the Homelite Brush Cutter has a friction-free, flexible shaft which delivers full 3.5 brake horsepower to the 10 inch circular blade. Hanger and handle bars are adjustable while a special harness evenly distributes the weight of the entire unit on both shoulders. A diaphragm type carburetor permits cutting in any position. The long five foot arm makes it easy to reach low to get under overhanging branches or to reach high for overhead cutting and limbing. The exclusive Homelite saw collar prevents binding by weeds, leaves, or twigs. For further information, write Homelite Corporation, Port Chester, New York.

CATERPILLAR ANNOUNCES ANOTHER "FIRST":

NEW OIL CLUTCH for the NO. 12 MOTOR GRADER



Arrows show path of oil through housing with clutch disengaged. Facings remain cool and bathed in oil, which is carried to outlet at top by flywheel ring gear. The two steel clutch discs and clutch brake are faced with pressure-processed cork, which gives an excellent coefficiency of friction and long wear.



The new oil clutch for the No. 12 Motor Grader gives you the same reliability and improved performance as the thoroughly job-proved oil clutch in Caterpillar track-type Tractors. Rugged and reliable, it uses oil from the engine lubrication system. Here are some of the things the new oil clutch for the CAT* No. 12 can mean to *you:*

LONGER WORK LIFE—In actual on-the-job tests, clutch facings wear less than the thickness of a human hair in one thousand hours' operation! Thick clutch facings mean that work life is extended thousands of hours before discs need be replaced. And constant "oil bath" lubrication reduces wear on all moving parts.

LESS MAINTENANCE—Adjustment every 1500 hours is not unusual, after initial "break in." This is equivalent to nearly nine months without adjustment on road maintenance work! No external lubrication is needed: internal oil system lubricates pilot and throwout bearings.

GREATER EFFICIENCY—The clutch is constantly cooled, never exceeding normal engine oil temperature. This practically eliminates clutch fade, greatly reduces slippage due to overheating, and means that the clutch retains "like new" operation for thousands of hours.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Cat and Caterpillar are Registered Trademarks of Caterpillar Tractor Co., U. S. A.

99% OF ALL CAT MOTOR GRADERS ARE STILL IN USE

More *Power* Per Pound

That's the key to bigger profits from production cutting . . . more power per pound. And that's what Homelite gives you in the Model 17 Chain Saw. It's packed with power for fast cutting. You get a full 3.5 hp delivered right to the chain. Yet it weighs only a light, light 22-pounds for easy operation. Most important, it stands up under the grind with a minimum of down time and lowest possible maintenance. 14″ to 38″ straight blades or 14″ and 18″ plunge cut bows are interchangeable. New attachments for clearing or brush cutting are now available. Get your key to bigger profits. Send for information on the complete line of Homelite Chain Saws today.

PERFORMANCE · DEPENDABILITY · SERVICE

HOMELITE CORPORATION

4109 RIVERDALE AVENUE • PORT CHESTER, N. Y.

Canadian Distributors:

Terry Machinery Co., Ltd., Toronto, Montreal, Vancouver, Ottawa